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VOLUME 23/ NUMBER 9
MAY 8, 1985
ACC. NOS. N85-17932 TO N85-18948

STAR

AN ABSTRACT JOURNAL

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Scientific and Technical Aerospace Reports, Volume 23, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Government Information Systems.

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US ISSN 0036-8741

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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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07 AIRCRAFT PROPULSION AND POWER 1281

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

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Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

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17 SPACECRAFT COMMUNICATION, COMMAND AND TRACKING N.A.

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

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20 SPACECRAFT PROPULSION AND POWER 1287

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80 SOCIAL SCIENCES (GENERAL) **N.A.**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **1401**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 1401
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 1403
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1403
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 1410

89 ASTRONOMY 1411
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1414
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1415
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 1416
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1417
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 1418

Note: N.A. means that no abstracts were assigned to this category for this issue.

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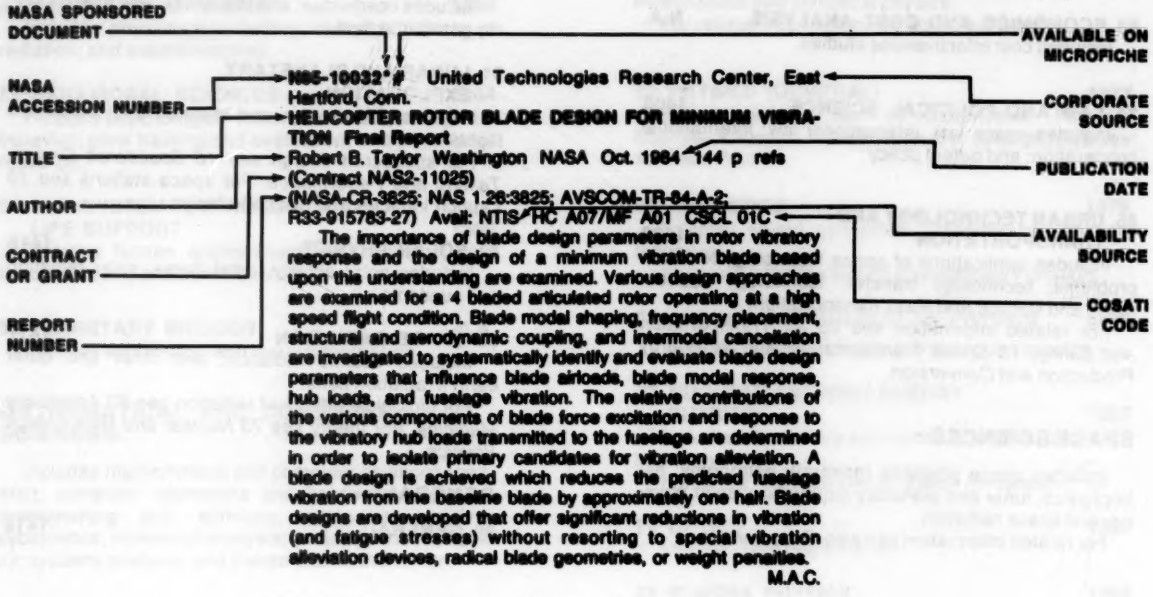
TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
AVAILABLE ON MICROFICHE
NASA ACCESSION NUMBER
N85-10032*#
United Technologies Research Center, East Hartford, Conn.
CORPORATE SOURCE
TITLE
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
PUBLICATION DATE
AUTHOR
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
(Contract NAS2-11025)
CONTRACT OR GRANT
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
AVAILABILITY SOURCE
REPORT NUMBER
COSATI CODE
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 9 MAY 8, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-17932* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING, A CONTINUING BIBLIOGRAPHY WITH INDEXES
Dec. 1984 213 p
(NASA-SP-7037(181); NAS 1.21:7037(181)) Avail: NTIS HC $6.00 CSCL 01A

This bibliography lists 823 reports, articles, and other documents introduced into the NASA scientific and technical information system in November 1984. Author

N85-17933 British Aerospace Aircraft Group, Kingston-upon-Thames (England).
INNOVATION IN BRITISH INDUSTRY (NOTABLY THE AIRCRAFT INDUSTRY) AND ITS VALUE: COLLECTED PAPERS
C. L. Bore Aug. 1984 10 p refs
(BAe-KRS-N-GEN-286) Avail: Issuing Activity

Aspects of innovation that most need improving in British industry are reviewed. The money values of technical innovations in the aircraft industry are discussed. Author (ESA)

N85-17934*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
ON THE FRONTIER: FLIGHT RESEARCH AT DRYDEN 1946-1981
Richard P. Hallion 1984 394 p refs
(NASA-SP-4303; NAS 1.21:4303; LC-83-14136) Avail: NTIS MF A01; SOD HC $15.00 as SN-033-000-00893-7 CSCL 01B

The history of flight research at the NASA Hugh L. Dryden Flight Research Center is recounted. The period of emerging supersonic flight technology (1944 to 1959) is reviewed along with the era of flight outside the Earth's atmosphere (1959 to 1981). Specific projects such as the X-15, Gemini, Apollo, and the space shuttle are addressed. The flight chronologies of various aircraft and spacecraft are given. R.S.F.

N85-17935*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN DESCRIPTION OF A MICROPROCESSOR BASED ENGINE MONITORING AND CONTROL UNIT (EMAC) FOR SMALL TURBOSHAFT
Anastacio N. Baez Jan. 1985 30 p refs
(NASA-TM-86860; E-2324; NAS 1.15:86860) Avail: NTIS HC A03/MF A01 CSCL 01B

Research programs have demonstrated that digital electronic controls are more suitable for advanced aircraft/rotorcraft turbine engine systems than hydromechanical controls. Commercially available microprocessors are believed to have the speed and computational capability required for implementing advanced digital control algorithms. Thus, it is desirable to demonstrate that off-the-shelf microprocessors are indeed capable of performing real time control of advanced gas turbine engines. The engine monitoring and control (EMAC) unit was designed and fabricated specifically to meet the requirements of an advanced gas turbine engine control system. The EMAC unit is fully operational in the Army/NASA small turboshaft engine digital research program. Author

N85-17936*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A VOICE-ACTUATED WIND TUNNEL MODEL LEAK CHECKING SYSTEM
William E. Larson Feb. 1985 8 p refs
(NASA-TM-86359; NAS 1.15:86359) Avail: NTIS HC A02/MF A01 CSCL 01B

A voice-actuated wind tunnel model leak checking system was developed. The system uses a voice recognition and response unit to interact with the technician along with a graphics terminal to provide the technician with visual feedback while checking a model for leaks. Author

N85-17937# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C. Directorate of Aerospace Sciences.
PROCEEDINGS OF THE WORKSHOP ON UNSTEADY SEPARATED FLOW HELD AT THE UNITED STATES AIR FORCE ACADEMY ON AUGUST 10-11, 1983 Interim Report
M. S. Francis and M. W. Luttges 1984 197 p
(AD-A148249; AFOSR-84-0911TR) Avail: NTIS HC A09/MF A01 CSCL 20/4

This two day program was comprised of 27 presentations on a wide variety of topics ranging from fundamental concepts to potential applications. Flows with time dependent boundary conditions leading to global separated flow structures were highlighted. For individual titles, see N85-17938 through N85-17961.

N85-17938# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
SUPERMANEUVERABILITY c05
W. B. Herbst *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 1-9 (For primary document see N85-17937 09-01)
(AD-P004153) Avail: NTIS HC A09/MF A01 CSCL 01/2

Supermaneuverability is defined as the capability of a fighter aircraft to execute tactical maneuvers with controlled side slipping and at angles of attack beyond maximum lift. This paper deals particularly with post stall maneuverability at zero side slipping since this element of supermaneuverability is relatively unknown. The analysis is based on optimum control calculation of simplified maneuver elements and on extensive manned and computerized close air combat simulation. This analysis explains the tactical advantage observed during combat simulations and leads to the definition of a typical maneuver duty cycle which is consistant with conventional air combat maneuvers with all aspect weapons. Reference is made to earlier studies about maneuvers with thrust vectoring and thrust reversal. Finally, requirements are given for

the necessary level of thrust-to-weight ratios and control power including indications of technical solutions. Author (GRA)

N85-17939# Lockheed Missiles and Space Co., Sunnyvale, Calif.
WING ROCK FLOW PHENOMENA **c02**
L. E. Ericsson *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 10-20 (For primary document see N85-17937 09-01)
(AD-P004154) Avail: NTIS HC A09/MF A01 CSCL 20/4

Flow mechanisms that can generate wing-rock type oscillations are described. It is shown that the slender wing rock phenomenon, the limit cycle oscillation in roll observed for very slender delta wings, is caused by asymmetric leading edge vortices and that vortex breakdown can never be the cause of it as it has a damping effect. For that reason slender wing rock is only realized for delta wings with more than 74 deg leading edge sweep for which asymmetric vortex shedding occurs before vortex breakdown. For straight or moderately swept wings the flow mechanics causing wing rock is two-dimensional in nature, closely related to the dynamic stall phenomenon. Pointed forebodies provide a third flow mechanism, asymmetric vortex shedding sensitive to body motion, which can generate a rocking motion of a slender vehicle unless it is completely axisymmetric. Author (GRA)

N85-17940# West Virginia Univ., Morgantown.
POTENTIAL APPLICATIONS OF FORCED UNSTEADY FLOWS **c34**
H. Viets, G. M. Palmer, and R. J. Bethke *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 21-27 (For primary document see N85-17937 09-01)
(Grant AF-AFOSR-0291-82)
(AD-P004155) Avail: NTIS HC A09/MF A01 CSCL 20/4

Forced unsteady flows are examined from the point of view of potential application of new devices which are made possible by the improved understanding of these flows. In particular, flows are examined which require no external driver but obtained their energy from the freestream velocity. Other flows require no moving parts at all to generate the unsteadiness. Author (GRA)

N85-17941# United Technologies Research Center, East Hartford, Conn.
UNSTEADY STALL PENETRATION OF AN OSCILLATING SWEPT WING **c02**
F. O. Carta *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 28-37 (For primary document see N85-17937 09-01)
(AD-P004156) Avail: NTIS HC A09/MF A01 CSCL 20/4

Results include: (1) Mean angle of attack has little or no effect on wave speed which in all cases increases uniformly with reduced frequency. Motion amplitude also has little or no effect on wave speed. Mach number has a small but consistent effect on wave speed, with higher Mach numbers yielding slightly smaller wave speeds; (2) Sweep angle has a dominant effect on wave speed. The overall wave speed for the unswept wing is consistently greater than that for the swept wing by a factor of 1.5 to 2.0. This represents a major failure above stall for the cosine law normalization which has been shown to be consistently valid below stall; (3) Mach number has a dominant effect on vortex inception angle and static stall angle, with a decrease in both angles as the chordwise Mach number increases; (4) Vortex inception is substantially independent of amplitude of motion and mean angle of attack; and (5) Local wave speed differences associated with sweep are confined to the region of the blade aft of the 15% chord. Wave speeds are substantially the same for both sweep angles forward of this chord location. GRA

N85-17942# Southwest Research Inst., San Antonio, Tex.
SIMULTANEOUS FLOW VISUALIZATION AND UNSTEADY LIFT MEASUREMENT ON AN OSCILLATING LIFTING SURFACE **c02**
R. L. Bass, J. E. Johnson, and J. F. Unruh *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 38-44 (For primary document see N85-17937 09-01)
(AD-P004157) Avail: NTIS HC A09/MF A01 CSCL 20/4

Boundary layer and trailing edge flow activities were recorded using hydrogen bubble flow visualization techniques on an oscillating lifting surface in a two-dimensional water tunnel. Simultaneous with flow documentation, unsteady lift was measured over a range of reduced frequencies from 0.5 to 10. Unsteady loads using classical, inviscid theories were predicted for the experimental conditions investigated. Reduced frequency bands exhibiting poor agreement between experiment and theory were identified and a correlation to observed flow phenomena was accomplished. The results support the use of a separate viscous model near the trailing edge coupled with an inviscid flow field model to predict unsteady loads. The results further show that for certain reduced frequency bands, classical inviscid solutions may be applicable and adequate. GRA

N85-17943# Flow Research, Inc., Kent, Wash.
A VISUAL STUDY OF A DELTA WING IN STEADY AND UNSTEADY MOTION **c02**
M. Gad-el-Hak, C. M. Ho, and R. F. Blackwelder *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 45-51 (For primary document see N85-17937 09-01)
(Contract F49620-82-C-0020)
(AD-P004158) Avail: NTIS HC A09/MF A01 CSCL 20/4

Two delta wings with a leading edge sweep of 45 deg and 60 deg were studied in a towing tank at chord Reynolds number up to 350,000. The wings were pitched about the quarter chord point through typical angles of attack of 15 deg + or - 15 deg, with a reduced frequency in the range of 0 to 3. In the steady state flow, dye visualizations revealed the existence of a shear layer near the leading edge that rolls up and forms discrete vortices parallel to the leading edge. These vortices were observed to pair at least once as they were convected downstream. Similar phenomena were observed in the unsteady case, except that the vortices shed from the leading edge were modulated and altered by the unsteady motion, which was an order of magnitude lower in frequency. In general, the unsteadiness delayed separation and promoted hysteresis similar to results obtained in unsteady two-dimensional airfoils. GRA

N85-17944# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.
COMPARATIVE VISUALIZATION OF ACCELERATING FLOW AROUND VARIOUS BODIES, STARTING FROM REST **c34**
P. Freymuth, M. Palmer, and W. Bank *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 52-57 (For primary document see N85-17937 09-01)
(AD-P004159) Avail: NTIS HC A09/MF A01 CSCL 20/4

Separation, vortex formation and turbulent decay are visualized for accelerating air flow around various bodies, starting from rest. The bodies investigated were a cylinder, a sphere, a flat plate, a round plate and an NACA 0015 airfoil. All bodies had the same characteristic length (body diameter or chord length) and were subjected to the same flow acceleration resulting in the same Reynolds number and allowing for a meaningful comparison. Author (GRA)

N85-17945# Analytical Methods, Inc., Redmond, Wash.
PREDICTION OF DYNAMIC STALL CHARACTERISTICS USING ADVANCED NONLINEAR PANEL METHODS **c05**
B. Maskew and F. A. Dvorak *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 58-72 (For primary document see N85-17937 09-01)
(Contract F49620-82-C-0019)
(AD-P004160) Avail: NTIS HC A09/MF A01 CSCL 20/4

This paper presents preliminary results of work in which a surface singularity panel method is being extended for modelling the dynamic interaction between a separated wake and a surface undergoing an unsteady motion. The method combines the capabilities of an unsteady time-stepping code and a technique for modelling extensive separation using free vortex sheets. Routines are developed for treating the dynamic interaction between the separated wake and the solid boundary in an

environment where the separation point is moving with time. The behavior of these routines is examined in a parallel effort using a two-dimensional pilot version of the three-dimensional code. This allows refinements in the procedures to be quickly developed and tested prior to installation into the main code. The extended code is coupled with an unsteady integral boundary layer method to examine the prediction of dynamic stall characteristics. The boundary layer code is accessed during the timestep cycle and provides the separation of locations as well as the boundary layer displacement effect the latter is modelled in the potential flow code using the source transpiration technique. GRA

N85-17946# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR UNSTEADY SEPARATED FLOWS c34
W. L. Hankey *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 73-75 (For primary document see N85-17937 09-01)
(AD-P004161) Avail: NTIS HC A09/MF A01 CSCL 20/4

By use of the time-dependent Navier-Stokes equations, simplifying assumptions are no longer necessary to investigate many classes of unsteady separated flows. The projected advancement of computer capability over the next few years renders questionable the wisdom of supporting basic research on short-cut approximate methods for analyzing unsteady separated flows. GRA

N85-17947# Colorado Univ., Boulder.
UNSTEADY AERODYNAMIC LOADING OF AN AIRFOIL DUE TO VORTICES RELEASED INTERMITTENTLY FROM ITS UPPER SURFACE c02
C. Y. Chow and C. S. Chiu *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 76-81 (For primary document see N85-17937 09-01)
(Contract F49620-83-K-0009)
(AD-P004162) Avail: NTIS HC A09/MF A01 CSCL 20/4

An unsteady flow analysis is made of the flow past a symmetric airfoil with identical vortices released intermittently from its upper surface. The vortex train is used to simulate the flow observed in the laboratory which was perturbed by an oscillating spoiler or a rotating cam embedded in the airfoil surface. Based on numerical computations, the airfoil lift has a general behavior that it increases oscillatorily with time, and seems to approach an asymptotic value as time increases indefinitely. The asymptotic lift is enhanced with increasing frequency as which vortices are generated, and is only slightly influenced by changing the vortex releasing position along the chord. The behavior of the drag is similar to that of the lift, but its magnitude is two orders smaller. Our study also indicates that it is more efficient to implement the vortex augmented unsteady lift at higher angles of attack of airfoil. Author (GRA)

N85-17948*# Scientific Research Associates, Inc., Glastonbury, Conn.
A NAVIER-STOKES CALCULATION OF THE AIRFOIL DYNAMIC STALL PROCESS c02
S. J. Shamroth *In* AFOSR Proc. of the Workshop on Unsteady, Separated Flow 1984 p 82-89 (For primary document see N85-17937 09-01)
(Contract NAS1-15214)
(AD-P004163) Avail: NTIS HC A09/MF A01 CSCL 20D

A time dependent Navier-Stokes calculation procedure has been applied to the problem of an NACA 0012 airfoil oscillating in pitch in a low Mach number, high Reynolds number environment. The calculated results show many of the known physical features, including sudden suction surface separation, vortices shed at the leading and trailing edges and the return to attached flow at low incidences. Both the lift and moment coefficient curves show the expected features and the calculated wall pressure coefficients show strong correspondence to measured data. Author (GRA)

N85-17949*# Southern Methodist Univ., Dallas, Tex.
SOME STRUCTURAL FEATURES OF UNSTEADY SEPARATING TURBULENT SHEAR FLOWS c34
R. L. Simpson *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 90-96 (For primary document see N85-17937 09-01)
(Contract NsG-2354)
(AD-P004164) Avail: NTIS HC A09/MF A01 CSCL 20D

Some physical features of unsteady separating turbulent boundary layers are presented for practical Reynolds numbers and reduced frequencies for helicopter and turbomachinery flows. Upstream of detachment in moderate amplitude flows, the flow is quasi steady, i.e., the phase averaged flow is described by the steady-free stream flow structure. Results show that oscillation waveform and amplitude strongly influence the detached flow behavior. GRA

N85-17950# McDonnell-Douglas Corp., Long Beach, Calif. Aircraft Div.
CAN THE SINGULARITY BE REMOVED IN TIME-DEPENDENT FLOWS? c02
T. Cebeci, A. A. Khattab, and S. M. Schimke *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 97-105 (For primary document see N85-17937 09-01)
(Contract F49620-82-C-0055)
(AD-P004165) Avail: NTIS HC A09/MF A01 CSCL 20/4

The evolution of unsteady boundary layers on oscillating airfoils is studied. The computational difficulties associated with the movement of the stagnation point as a function of space and time are solved by using a novel numerical scheme. Calculations are performed for pressure distributions typical of those found near the leading edge of airfoils. Results are presented for two cases. In the first, solutions are obtained for a flow with separation and with prescribed pressure distribution; they infer that a singularity develops and is of the same type as that observed on a circular cylinder started impulsively from rest. In the second, results are obtained for the same flow and the viscous flow solutions are interacted with the external flow by using an inverse boundary layer method. The interaction seems to remove the singularity, however, these results are preliminary and need to be checked and improved upon. Author (GRA)

N85-17951# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
ON THE SHEDDING OF VORTICITY AT SEPARATION c34
D. P. Telionis and D. Mathioulakis *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 106-116 (For primary document see N85-17937 09-01)
(AD-P004166) Avail: NTIS HC A09/MF A01 CSCL 20/4

Steady and unsteady velocity components over a backward-facing circular arc are measured by laser Doppler velocimetry. A periodic disturbance is added to the mean flow and the response of unsteady separation is investigated. Special attention is given to the distribution and the vorticity. Author (GRA)

N85-17952# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.
UNSTEADY SEPARATED FLOW: FORCED AND COMMON VORTICITY ABOUT OSCILLATING AIRFOILS c02
M. C. Robinson and M. W. Luttges *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 117-126 (For primary document see N85-17937 09-01)
(Grant AF-AFOSR-0037-81)
(AD-P004167) Avail: NTIS HC A09/MF A01 CSCL 20/4

Flow perturbations induced through dynamic sinusoidal oscillations of an NACA 0015, NACA 0012, and flat plate were examined across a wide range of test conditions. Phase locked multiple exposure flow visualization in conjunction with corroborative hotwire anemometry documented the development of temporally and spatially synchronous leading and trailing edge vortices induced through unsteady flow separation. Airfoil oscillation dynamics directly influenced vortex initiation, development and traversing velocities. The results suggest the existence of optimal combina-

tions of variables for maximizing both vortex strength and residence time over the airfoil. Author (GRA)

N85-17953# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.
UNSTEADY SEPARATED FLOWS: GENERATION AND USE BY INSECTS **c02**
M. W. Luttges, C. Somps, M. Kliss, and M. Robinson *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 127-136 (For primary document see N85-17937 09-01)
(AD-P004168) Avail: NTIS HC A09/MF A01 CSCL 20/4

The novel lift generation mechanism postulated by Weis-Fogh and evaluated by Lighthill in regard to hovering insects provided graphic evidence for the possible utility of unsteady flows. The present report summarizes flight mechanisms in dragonflies that appear to exploit unsteady flows to achieve rather remarkable aerodynamics. Overall, these experiments indicate that unsteady flows may be used to support quite sophisticated insect flight maneuvers. No significant change in wing geometry is needed to achieve such flight and only modest alterations in dynamic wing stroke variables are required. The observations made here indicate that dragonflies use mechanisms quite different from those used by the Chalcid wasp, as described by Weis-Fogh. Other means of exploiting unsteady separated flows may exist also within the insect world. GRA

N85-17954# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
THEORETICAL STUDY OF NON-LINEAR UNSTEADY AERODYNAMICS OF A NON-RIGID LIFTING BODY **c02**
J. C. Wu, N. L. Sankar, and H. H. Chen *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 137-147 (For primary document see N85-17937 09-01)
(Grant AF-AFOSR-0108-82)
(AD-P004169) Avail: NTIS HC A09/MF A01 CSCL 20/4

A recently developed general theory of aerodynamics is used in an investigation of nonlinear unsteady flow problems involving a nonrigid lifting body. It is shown that this theory, developed on the basis of viscous flow equations, permits the important interactive fluid dynamic elements dominating the aerodynamics of nonlinear unsteady flows to be identified and their contributions evaluated individually. Closed form expressions for the lift, the drag, and the power expenditure of the Weis-Fogh problem, considered as a special case of flexible lifting bodies, are presented and discussed. GRA

N85-17955# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THEORETICAL INVESTIGATION OF DYNAMIC STALL USING A MOMENTUM INTEGRAL METHOD **c02**
E. J. Jumper and J. E. Hitchcock *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 148-151 (For primary document see N85-17937 09-01)
(AD-P004170) Avail: NTIS HC A09/MF A01 CSCL 20/4

An analytical study into the gust response of an airfoil is presented. The momentum integral equation for steady flow is extended into the airfoil that experiences a constant-rate-of-change of angle-of-attack gust. The von Karman-Pohlhausen method of integration is successfully modified to incorporate the additional transient flow terms; the equation of closure necessary to do this is also presented. Finally, computation of the flow about a Joukowski airfoil using the new equations is performed and the results are presented and discussed. It is shown that these results are in agreement with existing experimental data. GRA

N85-17956# Texas Technological Univ., Lubbock.
PRELIMINARY RESULTS FROM THE UNSTEADY AIRFOIL MODEL USTAR2 **c02**
J. H. Strickland, J. W. Oler, and B. J. Im *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 152-157 (For primary document see N85-17937 09-01)
(Grants AF-AFOSR-1218-74; AF-AFOSR-3727-52)
(AD-P004171) Avail: NTIS HC A09/MF A01 CSCL 20/4

Preliminary results from an UnSTeady AiRfoil analysis in two dimensions have been obtained from a computer code (USTAR2) developed by the present authors. This computer code is based upon an analysis which uses a doublet panel method to model the airfoil surface, an integral unsteady boundary layer scheme to model the viscous attached flow, and discrete vortices to model the detached boundary layers which form the airfoil wake region. This model has been used successfully to predict steady lift and drag coefficients as well as pressure distributions for several airfoils with both attached and detached boundary layers. In addition, calculations have been made for a limited number of cases for both attached and detached unsteady flow situations. These calculations are compared in a cursory way with experimental data to point out some of the strengths and weaknesses of the present formulation. GRA

N85-17957# Stanford Univ., Calif.
EXPERIMENTS ON CONTROLLED, UNSTEADY, SEPARATED TURBULENT BOUNDARY LAYERS **c34**
W. C. Reynolds, R. Jayaraman, and L. W. Carr *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 158-164 (For primary document see N85-17937 09-01)
(AD-P004172) Avail: NTIS HC A09/MF A01 CSCL 20/4

Experiments on turbulent boundary layers were subjected to controlled unsteadiness were performed in a special water channel. The flow is steady in the development section upstream of the unsteady test section where the boundary layer is subjected to an oscillating adverse free stream velocity gradient sufficient to induce flow reversal near the wall. Measurements of the mean, oscillatory, and turbulence components of the streamwise velocity in the boundary layer indicate that the mean velocity and mean turbulent stresses are unaffected by the oscillations, whereas the periodic components of these quantities are strongly dependent upon frequency. At low frequencies the boundary layer behaves quasistaticly at intermediate frequencies the boundary layer behavior correlates with the Strouhal number based on the length of the unsteady region and at high frequencies the outer region of the boundary layer moves as a slug while the sublayer behaves as a Stokes layer described by laminar equations. Reverse flows occur in this Stokes layer, but the boundary layer remains thin and hence attached to the surface. GRA

N85-17958# University of Southern California, Los Angeles.
GENESIS OF UNSTEADY SEPARATION **c34**
C. M. Ho *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 165-168 (For primary document see N85-17937 09-01)
(Contract F49620-82-K-0019)
(AD-P004173) Avail: NTIS HC A09/MF A01 CSCL 20/4

Unsteady separation is a problem of great technical importance but with little basic understanding. A very limited amount of experimental data is available because of the difficulties involved in measuring the temporally evolving separated flows. In this presentation we first examine the flow field of a downstream moving separation in detail and then we explore the possibility of applying the learned physical mechanism to the upstream moving separation problems and to the unsteady separation on a lifting surface. Author (GRA)

N85-17959# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
FLOW SEPARATION INDUCED BY PERIODIC AERODYNAMIC INTERFERENCE **c02**
E. E. Covert, P. F. Lorber, and C. M. Vaczy *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 169-176 (For primary document see N85-17937 09-01)
(Grant AF-AFOSR-0282-80)
(AD-P004174) Avail: NTIS HC A09/MF A01 CSCL 20/4

Analysis of experimental surface pressure distributions on an NACA 0012 airfoil has revealed four flow states: attached, separated, borderline, and dynamically separated. The important parameters that determine the flow state are Reynolds number, reduced frequency, airfoil angle of attack, and surface condition at the leading edge. Testing was done at Re=700,000, .5< = k

< =6.4, and 0<=alpha<=18 degrees. For this flow the dynamically separated state takes the form of an alternation between attached and separated flow. It has a period that ranges from 1 to 30 times that of the unsteady perturbation. In the separated state a convected surface pressure disturbance was identified, and found to propagate downstream from a location near the leading edge at a phase speed of 1/3 to 1/2 that of the freestream velocity. GRA

N85-17960# Vehicle Research Corp., Pasadena, Calif.
LEADING EDGE SEPARATION CRITERION FOR AN OSCILLATING AIRFOIL c02
E. C. James *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 177-183 (For primary document see N85-17937 09-01)
(Contract F49620-82-C-0038)
(AD-P004175) Avail: NTIS HC A09/MF A01 CSCL 20/4

Unsteady flow about the well-rounded nose of a subsonic airfoil is investigated from the viewpoint of leading edge separation. For an airfoil undergoing forced pitching and heaving motions in a uniform flow, fluid accelerations about the leading edge can be enormous according to inviscid flow theory. Such accelerations are limited by viscous flow and separation realities. The method of matched asymptotic expansions is used to develop a uniformly valid first order approximation to the inviscid flow about the airfoil's leading edge which is driven by a history dependent term related to the airfoil's transverse motions. Applying this flow to the laminar boundary layer flow at the airfoil nose produces possibilities for a laminar boundary layer to separate. A method is proposed for predicting leading edge dynamic stall based upon relating properties of the envelope of the unsteady part of the boundary layer speed and shear stress to the steady part of the boundary layer flow. GRA

N85-17961# Stanford Univ., Calif. Dept. of Mechanical Engineering.
NATURAL UNSTEADINESS OF A SEPARATION BUBBLE BEHIND A BACKWARD-FACING STEP c34
J. K. Eaton and A. E. Alving *In* AFOSR Proc. of Workshop on Unsteady Separated Flow 1984 p 184-186 (For primary document see N85-17937 09-01)
(AD-P004176) Avail: NTIS HC A09/MF A01 CSCL 20/4

Low frequency unsteadiness of a reattaching shear layer was studied in subsonic flow behind a backward facing step. Power spectra of streamwise velocity fluctuations were measured using a hotwire probe. Spectra measured near the centerline of the separated shear layer showed that a substantial fraction of the measured turbulence intensity occurs at frequencies significantly lower than the large eddy passing frequency. The strong low-large-eddy passing frequency. The strong low frequency contribution is not present in the upstream boundary layer or in the reattached shear layer. It was concluded that the low frequency energy is caused by a nonperiodic vertical motion of the separated shear layer. Author (GRA)

N85-17962# Air Force Human Resources Lab., Williams AFB, Ariz.
THE IMAGE 3 CONFERENCE PROCEEDINGS Final Report
E. G. Monroe Sep. 1984 502 p Conf. held at Phoenix, Ariz., 30 May - 1 Jun. 1984
(AF Proj. 9983)
(AD-A148636; AFHRL-TR-84-36) Avail: NTIS HC A22/MF A01 CSCL 01/2

The IMAGE Conference is the only major conference devoted entirely to issues relevant to the development and use of imagery generated and displayed for visual flight simulation. The purpose of the conference is to provide a forum for presenting and discussing topics concerned with the imagery generated for out of the cockpit and sensor visual flight simulation. The Air Force recognizes that the rapid technological advanced and used of real-time visual simulators requires that the interchange of information among the user organizations be expanded in order to promote new developments, applications, and techniques, and to avoid unnecessary duplication of efforts. Papers are solicited in all areas compatible with theme of the conference including engineering research and development, behavioral research, application and techniques, program progress and status, as well as technical problems and potential solutions. Pertinent topics include but are not necessarily limited to: (1) software/hardware developments directly resulting in an enhancement of image capabilities; (2) psychological determination of visual cue requirements; and (3) environmental data base design and structure. For individual titles, see N85-17963 through N85-17992.

N85-17963# Air Training Command, Nellis AFB, Nev.
USING A LIMITED FIELD OF VIEW SIMULATOR TO INSTRUCT HIGH SPEED, LOW ALTITUDE FLYING SKILLS c09
M. Miller *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 7-20 (For primary document see N85-17962 09-01)
(AD-P004309) Avail: NTIS HC A22/MF A01 CSCL 05/9

This paper describes the use of an A-7 Vital IV (three screen) visual simulator in a low altitude training program. This program is the first to use such a simulator in the training of tactical fighter pilots to operate in the low altitude environment. The program is part of the syllabus used in the Air National Guard, Fighter Weapons School program for highly experienced A-7D pilots. The Low Altitude Training portion of this syllabus consists of 12 hours of academic instruction, a 1 hour simulator and a two phase flying program of at least two aircraft sorties. This paper discusses the simulator profile, explains each task, how it is accomplished and provides a subjective evaluation of its effectiveness. The paper identifies the training limitations imposed by such a low fidelity visual system, recommends several additional uses within the existing capability of the simulator, and identifies several minimum criteria for any full mission simulator. Author (GRA)

N85-17964# Dayton Univ., Ohio. Research Inst.
VISUAL PERCEPTUAL ASPECTS OF LOW LEVEL HIGH SPEED FLIGHT AND FLIGHT SIMULATION c09
R. S. Kellogg and M. Miller *In* AF Human Resouces Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 21-36 (For primary document see N85-17962 09-01)
(AD-P004310) Avail: NTIS HC A22/MF A01 CSCL 05/9

The low level high speed flight arena has opened up as a very important one in the past several years. Weapon systems and tactics developments have forced the acquisition of pilot skills in low level, high speed flight. In order to remain undetected and complete his mission, the pilot is forced to fly below enemy radar. This carries with it the constant threat of contact with the ground, which is of course as lethal as enemy missiles. As a consequence of this necessity to fly low and fast, a thorough going training program has been under development for the past three years at the 162nd Fighter Weapons School, USAFR, Tucson, Arizona, in collaboration with the Human Resources Laboratory, Williams AFB, Arizona. The purpose of the present paper is to describe in some detail the visual/perceptual aspects of low level, high speed flight as they are currently viewed by the developers of this program. The flighter simulator has already begun to play an important role in this training program, and this role will certainly expand with the fast developing simulator technology in conjunction with better understanding of the training requirements. GRA

N85-17965# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
ALTITUDE CONTROL USING ACTION-DEMANDING INTERACTIVE DISPLAYS: TOWARD AN ACTIVE PSYCHOPHYSICS c08
R. Warren and G. R. McMillan *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 37-51 (For primary document see N85-17962 09-01)
(AD-P004311) Avail: NTIS HC A22/MF A01 CSCL 01/2

Ecological approaches to perception and action emphasize the importance of exploration and manipulation for obtaining useful information. This seems to apply to the demanding task of low altitude flight. However, the ecological approach currently uses

the same passive methods used in traditional psychophysics: observers may only respond to a display in a manner which does not affect the display (e.g., yes/no or scaling judgments). Observers generally cannot manipulate the display to provide information which they, and not the experimenter, determine. A new methodology which both permits and demands observer action is needed for active performance. This paper outlines the beginnings of an active psychophysics and illustrates the techniques with an experiment designed to evaluate altitude holding in the presence of a gust. Initially, the techniques borrow heavily from those in manual tracking studies. The displays are a joint function of experimenter chosen initial conditions, observer control inputs, and a continuous gust disturbance. Sum-of-sines forcing functions and human operator describing functions are highlighted. Author (GRA)

N85-17966# LTV Aerospace Corp., Dallas, Tex.
LOW ALTITUDE HIGH SPEED FLIGHT SIMULATION USING VIDEO DISC TECHNOLOGY **c09**
V. Devarajan, J. T. Hooks, Jr., and D. C. McGuire *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 53-65 (For primary document see N85-17962 09-01)
(AD-P004312) Avail: NTIS HC A22/MF A01 CSCL 01/2

The LTV Aerospace and Defense Company's visual technology uses video discs as direct access and storage devices of video data obtained from a series of discrete photographs of the gaming area. Each discrete photograph is electronically scanned, converted to video data, formated and stored on video disc. When needed for display, the data is retrieved from video disc, processed and manipulated to display the correct perspective view of the terrain relative to the position and attitude of the simulated aircraft. The pilot has complete freedom of route and attitude within the gaming area. Extensions to the basic video disc technology are currently under development to provide visual simulation of low level tactical missions. This paper describes the algorithm modifications and hardware/software design issues involved in real time generation of low-level/high-speed scenes. Descriptions are also provided of a non-real time emulation of the concepts and hardware design. Author (GRA)

N85-17967# Tactical Airlift Training Group (34th), Little Rock AFB, Ark.
SIMULATING SPEED AND HEIGHT CUES IN THE C-130 WEAPON SYSTEM TRAINER **c09**
M. J. Sieverding *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 69-77 (For primary document see N85-17962 09-01)
(AD-P004313) Avail: NTIS HC A22/MF A01 CSCL 01/2

The C-130 Weapon System Trainer (WST) at Little Rock AFB, Arkansas is, perhaps, the most realistic full mission simulator in DoD. Much of its realism and training value comes from the ability of its full color, CGI visual system to provide speed and altitude cue while flying low level over a real world visual data base (VDB) of more than 50,000 square nautical miles. The C-130 aircraft is navigated visually while flying at approximately 250 knots and 300 feet above the ground. Visual ground references in the C-130 WST must realistically reflect chart information and provide the visual cues necessary for confident flight above the ground contour. This paper describes various types of speed and height cues and highlights the major attributes of the C-130 WST visual system that give these cues during a typical C-130 WST mission profile. Many internal conclusions and observations are admittedly subjective, based on several years of system use and thousands of hours of flying time, and not confirmed by hard data from the behavioral sciences community. The rate of technological change has far outpaced our ability to quantify its impact on human factors under controlled and statistically sound conditions. Those offices with the authority to procure and apply new simulator technology are quite reasonably hesitant to provide funding without such proof. However, the presumed benefits of using new technology can sometimes outweigh the risk of using that technology without analytic proof of its benefits. Funding actions may at times be the result of intuitive judgment and visceral reaction, but full acceptance and application of new technology requires analytic proof of its impact on human factors. GRA

N85-17968# Grumman Aerospace Corp., Bethpage, N.Y.
PRODUCING HIGH SCENE CONTENT WITH PERSPECTIVE VALIDITY **c09**
G. Y. Gardner and R. S. Rulon *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 79-94 (For primary document see N85-17962 09-01)
(AD-P004314) Avail: NTIS HC A22/MF A01 CSCL 01/2

Maintaining perspective validity in visual displays is essential to providing proper training cues. Perspective validity has many aspects, including correct perspective transformation of geometric shapes, exact determination of surface priority relationships, accurate shading of curved as well as planar surfaces, consistent mapping of texture patterns onto scene surfaces, and proper representation of aerial perspective. This paper describes the mathematical models used in Grumman's nonedge computer image generation CIG technology to maintain perspective validity in all its aspects. Author (GRA)

N85-17969# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
COLOR VISUAL SIMULATION APPLICATIONS AT THE DEFENSE MAPPING AGENCY **c74**
J. D. Simley *In* AF Human Resources Lab. The Image 3 Conf. Proc. Sep. 1984 p 95-107 (For primary document see N85-17962 09-01)
(AD-P004315) Avail: NTIS HC A22/MF A01 CSCL 08/2

The Defense Mapping Agency (DMA) produces the Digital Landmass System data base to provide culture and terrain data in support of numerous aircraft simulators. In order to conduct data base and simulation quality control and requirements analysis, DMA has developed the Sensor Image Simulator which can rapidly generate visual and radar static scene digital simulations. The use of color in visual simulation allows the clear portrayal of both landcover and terrain data, whereas the initial black and white capabilities were restricted in this role and thus found limited use. Color visual simulation has many uses in analysis to help determine the applicability of current and prototype data structures to better meet user requirements. Color visual simulation is also significant in quality control since anomalies can be more easily detected in natural appearing forms of the data. The realism and efficiency possible with advanced processing and display technology, along with accurate data, make color visual simulation a highly effective medium in the presentation of geographic information. As a result, digital visual simulation is finding increased potential as a special purpose cartographic product. These applications are discussed and related simulation examples are presented. Author (GRA)

N85-17970# Michigan Univ., Ann Arbor.
AUTOMATED AND INTERACTIVE DATA BASE GENERATION **c43**
B. Ohmann and B. Fowler *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 109-124 (For primary document see N85-17962 09-01)
(AD-P004316) Avail: NTIS HC A22/MF A01 CSCL 08/2

Until the mid 70's, visual simulation had been limited to small areas, primarily airfields and aircraft carriers, and complexity of the data bases was quite restricted due to the limited capacity of the image generators. Today training simulators require realistic terrain and gaming areas encompassing hundreds of thousands of miles, yet need accurate highly detailed insets for nap-of-the-earth flights. This paper will discuss improvements in data base generation technology which have allowed gaming area realism to keep pace with rapid advancement of Image Generator capabilities. Author (GRA)

N85-17971# Evans and Sutherland Computer Corp., Salt Lake City, Utah.
GEOGRAPHIC SUBDIVISION AND TOP LEVEL DATA STRUCTURES, COLUMBUS, MAGELLAN, AND EXPANDING CIG (COMPUTER IMAGE GENERATION) HORIZONS **c43**

L. C. Clark and M. R. Pafford *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 129-149 (For primary document see N85-17962 09-01)
(AD-P004317) Avail: NTIS HC A22/MF A01 CSCL 08/2

Recent advances in CIG technology have made it possible to accommodate the production of very large map correlate visual data bases of homogeneous feature density. Inherent in the top level design of a visual data base is a strategy for geographic subdivision. This strategy is implemented in a top level data structure which is processed by the CIG hardware to determine which portions of a visual data base to display. The top level data structure also dictates how the visual data base must be modeled. Since a visual data base is typically constructed in a 3D Cartesian coordinate system, the problems historically associated with round to flat Earth map projections are also encountered in top level data structures. There are also constraints imposed by the CIG system used. We will review the standard methods of geographic subdivision and discuss their limitations when applied to training requirements. We will explore a new strategy for geographic subdivision of a visual data base utilizing the military UTM and UPS grid systems and the leverage derived from innovative modeling techniques; i.e., semiautomatic generation of terrain DLMS data, and strategies for reusing common scene elements. We will discuss how these concepts are currently being implemented into visual data base design and will show how an extrapolation of these trends can be applied to the problem of whole Earth navigation training. GRA

N85-17972# Evans and Sutherland Computer Corp., Salt Lake City, Utah.
CIG (COMPUTER IMAGE GENERATION) DATA BASES IN AN INSTANCE: BITS AND PIECES **c61**
J. L. Costenbader *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 151-163 (For primary document see N85-17962 09-01)
(AD-P004318) Avail: NTIS HC A22/MF A01 CSCL 01/2

Strategies may be developed to reuse bits and pieces of CIG data base models and map them throughout the data base to create a one to one real world correspondence. The net effect is that data base development costs are reduced and the amount of required on-line data storage is decreased. Further, scene densities may be increased to take full advantage of image generator capabilities and are not degraded by lack of on-line storage availability. This notion implies that there exists a library of CIG models of standard cultural features that may be mapped or instanced throughout the geographic region. Further, the geographic region itself is a terrain model made up of instanced pieces derived from the Digital Landmass System (DLMS) data base, Digital Terrain Elevation Data (DTED). Another implication is that the image generator (IG) is capable of run time replication of these models throughout the data base. This concept of a library of cultural features ties closely to data provided by the Defense Mapping Agency (DMA) in the (DLMS) data base, 2nd Edition as well as the prototype specification to support High Resolution/Terrain Analysis Applications. This paper will show methods used to develop a collection of Bits and Pieces of real world cultural features and how to use information from DMA data tapes to map these features onto the terrain. The nature of the IG hardware used to achieve these results will also be discussed. GRA

N85-17973# General Dynamics Corp., St. Louis, Mo.
THE GENERATION OF THREE-DIMENSIONAL DATA BASES USING A BUILDING BLOCK APPROACH **c82**
D. D. Smart, R. D. Teichgraeber, and A. C. Chirieleison *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 165-176 (For primary document see N85-17962 09-01)
(AD-P004319) Avail: NTIS HC A22/MF A01 CSCL 01/2

Simulation system visual data base designs must provide engineers and test pilots with adequate realism in mission scenarios to insure acceptable results without the luxury of long design schedules. The objective is to build large three-dimensional data bases quickly and efficiently, while generally matching terrain and landscape features. The BUILDING BLOCK approach is presented as a means to achieve this objective. An example is presented to illustrate this approach. Author (GRA)

N85-17974# Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Brevannes (France).
SODERN VISUALIZATION SYSTEM (SVS) FOR FLIGHT SIMULATION **c09**
F. X. Doittau, J. R. Huriet, and M. Tissot *In* AF Human Resouces Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 193-203 (For primary document see N85-17962 09-01)
(AD-P004320) Avail: NTIS HC A22/MF A01 CSCL 01/2

The Titus light valve is actually a two-dimension analogical memory which is electronically controlled. It is well adapted to flight simulation requirements because it supplies high resolution, high brightness, flicker-free images. The SVS (SODERN Visualization System) uses three Titus light valves to project full color images at 30 Hz rate. Already developed models supply good quality images; further improvements are foreseen in near future, especially for geometrical resolution. GRA

N85-17975# Essex Corp., Alexandria, Va.
AN OVERVIEW OF THE RESEARCH PROGRAM AT THE VISUAL TECHNOLOGY RESEARCH SIMULATOR **c09**
G. Lintern, D. C. Wightman, and D. P. Westra *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 205-221 (For primary document see N85-17962 09-01)
(AD-P004321) Avail: NTIS HC A22/MF A01 CSCL 01/2

The behavioral research program at the Visual Technology Research Simulator is in its sixth year. Although research has emphasized visual issues in simulator training of flight skills, other hardware and instructional technology issues have been explored. This paper outlines significant features of the program's research plan and summarizes the major results. GRA

N85-17976# Rediffusion Simulation, Inc., Arlington, Tex.
THE USE OF LASERS IN WIDE-ANGLE VISUAL SYSTEMS **c36**
B. Barber *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 223-237 (For primary document see N85-17962 09-01)
(AD-P004322) Avail: NTIS HC A22/MF A01 CSCL 01/2

Performance requirements and associated problems of wide-angled displays are discussed, and possible solutions based on the use of lasers outlined. Included, is a helmet-mounted projector system currently being built for the Naval Training Equipment Center. Author (GRA)

N85-17977# Air Force Human Resources Lab., Williams AFB, Ariz.
CONSIDERATIONS IN AN OPTICAL VARIABLE ACUITY DISPLAY SYSTEM **c74**
R. B. Bunker and R. Fisher *In its* The IMAGE 3 Conf. Proc. Sep. 1984 p 239-251 (For primary document see N85-17962 09-01)
(AD-P004323) Avail: NTIS HC A22/MF A01 CSCL 01/2

This paper describes an effort to establish feasibility and quantify parameters of a truly optimal simulator visual system, i.e., one that fully satisfies human visual requirements with an absolute minimum of processing and display equipment. The concept is described and compared to alternate approaches with respect to size and complexity. The current effort to define parameters required to minimize potential operator distractions is described and results to date are presented. Author (GRA)

N85-17978# General Electric Co., Daytona Beach, Fla.
DESIGN CONSIDERATIONS FOR AN EYE TRACKED AOI (AREA OF INTEREST) DISPLAY SYSTEM **c09**
F. B. Neves *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 255-266 (For primary document see N85-17962 09-01)
(AD-P004324) Avail: NTIS HC A22/MF A01 CSCL 01/2

The potential benefits of using an Area of Interest (AOI) display

for high performance out-the-window visual simulation is evidenced by the current activity in this display technology. The AOI concept can be implemented in many versions. In each AOI display type a complex tradeoff of performance parameters must be considered. A review of these considerations will be discussed in this paper concentrating upon the display versus the CIG. The display being developed for the Visual System Component Development Program (VSCDP) by the General Electric Company (GE) is an AOI display concept. The major features of the display system and the current status of the display development will be discussed.
Author (GRA)

N85-17979# General Electric Co., Daytona Beach, Fla. Simulation and Control Systems Dept.
CONTROL SYSTEMS ANALYSIS PROGRAM: A TOOL FOR ANALYSIS OF THE GE-VSCDP (GENERAL ELECTRIC-VISUAL SYSTEM COMPONENT DISPLAY PROGRAM) IMAGE DISPLAY SYSTEM **c08**
C. Chi and E. Pollak *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 267-278 (For primary document see N85-17962 09-01)
(AD-P004325) Avail: NTIS HC A22/MF A01 CSCL 01/2

CSAP is a simulation program used to analyze the performance of the GE-VSCDP image display system. It has been used to define some unknowns and to analyze the AOI/BG image's shear effect and dynamic distortion due to finite servo velocity. Of major importance, it is used to optimize the image display system to minimize the displacement error between the center of CIG image and the center and the servo projector. Author (GRA)

N85-17980# Singer Co., Silver Spring, Md. Link Simulation Systems Div.
PROGRESS REPORT ON AN EYE-SLAVED AREA-OF-INTEREST VISUAL DISPLAY **c09**
H. M. Tong and R. A. Fisher *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 279-294 (For primary document see N85-17962 09-01)
(AD-P004326) Avail: NTIS HC A22/MF A01 CSCL 01/2

A dome-projection real-image system based on an eye-slaved area-of-interest (AOI) concept has been under development for some time at the Link Flight Simulation Division of The Singer Company. The Link approach provides a high-resolution area set within a wide-field-of-view background. The display image is presented to the trainee using light valve projection on a dome screen, with the high-resolution AOI inset slaved to the trainee's eye line of sight. The display development program at Link has progressed past the system integration phase and is undergoing proof-of-concept test and evaluation. The system approach and preliminary test findings are discussed in this paper. Author (GRA)

N85-17981# Rediffusion Simulation, Inc., Arlington, Tex.
AIR COMBAT VISUAL SIMULATION USING A HEAD SLAVED PROJECTOR **c09**
P. M. Murray, G. J. Olive, M. E. Roberts, and O. Wynn *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 295-311 (For primary document see N85-17962 09-01)
(AD-P004327) Avail: NTIS HC A22/MF A01 CSCL 01/2

An experimental system is described which is aimed at providing a low cost air combat training capability by the use of a head coupled projector giving a wide angle display with a high resolution central region and a low resolution peripheral region.
Author (GRA)

N85-17982# KFO Associates, Inc., Wyckoff, N.J.
A SECOND GENERATION WAVIDS (WIDE ANGLE VIRTUAL IMAGE DISPLAY SYSTEM) **c09**
A. Cox and W. V. Dykes *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 315-329 (For primary document see N85-17962 09-01)
(Contract N61339-83-C-0096)
(AD-P004328) Avail: NTIS HC A22/MF A01 CSCL 01/2

A second generation WAVIDS (Wide Angle Virtual Image Display System) has been designed using Fresnel lenses. The instantaneous field of view is 75 degrees, and the total field of view is 90 degrees, with an eye-clearance of 38.0 inches. The correction of spherical aberration, coma and astigmatism leads to a design with 30% negative distortion. An auxiliary optical system has, therefore, been designed which takes an undistorted image and introduces a compensating 30% distortion. As a result an undistorted image is viewed through the WAVIDS. GRA

N85-17983*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECTS OF TIME DELAY IN MAN-MACHINE CONTROL SYSTEMS: IMPLICATIONS FOR DESIGN OF FLIGHT SIMULATOR VISUAL-DISPLAY-DELAY COMPENSATION **c54**
D. F. Crane *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 331-343 Sponsored by NASA (For primary document see N85-17962 09-01)
(AD-P004329) Avail: NTIS HC A22/MF A01 CSCL 01/2

When human operators are performing precision tracking tasks, their dynamic response can often be modeled by quasi-linear describing functions. That fact permits analysis of the effects of delay in certain man machine control systems using linear control system analysis techniques. The analysis indicates that a reduction in system stability is the immediate effect of additional control system delay, and that system characteristics moderate or exaggerate the importance of the delay. A selection of data (simulator and flight test) consistent with the analysis is reviewed. Flight simulator visual-display delay compensation, designed to restore pilot aircraft system stability, was evaluated in several studies which are reviewed here. The studies range from single-axis, tracking-task experiments (with sufficient subjects and trials to establish the statistical significance of the results) to a brief evaluation of compensation of a computer generated imagery (CGI) visual display system in a full six degree of freedom simulation. The compensation was effective, improvements in pilot performance and workload or aircraft handling qualities rating (HQR) were observed. Results from recent aircraft handling qualities research literature, which support the compensation design approach, are also reviewed. Author (GRA)

N85-17984# CAE Electronics Ltd., Montreal (Quebec).
THE FIBER-OPTIC HELMET-MOUNTED DISPLAY **c06**
B. Welch and M. Shenker *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 345-361 (For primary document see N85-17962 09-01)
(AD-P004330) Avail: NTIS HC A22/MF A01 CSCL 01/2

The feasibility of the fiber optic helmet mounted display (FOHMD) concept has been demonstrated on a breadboard system installed on a simulator at the Air Force Human Resources Laboratory (AFHRL). Behavioral and engineering evaluation are currently being conducted to determine the optimum design specification for an Engineering Prototype scheduled for completion in late 1984. This paper describes the significant engineering aspects of the FOHMD together with the exploratory program for improving its performance. Author (GRA)

N85-17985# CAE Electronics Ltd., Montreal (Quebec).
BINOCULAR OVERLAP IN A FIBER OPTIC HELMET MOUNTED DISPLAY **c06**
R. Kruk and T. M. Longridge *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 363-378 (For primary document see N85-17962 09-01)
(AD-P004331) Avail: NTIS HC A22/MF A01 CSCL 01/2

Target detection, motion detection, and flight performance were compared under conditions of 25 and 45 binocular overlap using only the low resolution background channels of a fiber optic helmet mounted display (FOHMD). In experiments 1 and 2, eight experienced fighter pilots viewed aircraft targets which either approached ownship or moved vertically in the field of view, respectively, at various angles of off axis eccentricity. As an additional task, pilots flew the system as an air combat simulator and were required to track, engage, and destroy an airborne target. The results indicated target and motion detection and binocularly displayed targets were superior to that of monocularly displayed targets. There was

no significant difference in target detection or motion detection between the two overlap conditions, per se, nor between left and right fields of view. In both overlap conditions, performance was degraded within 5 of the lateral edges of the field of view, and suppression was evident in contralateral fields in the areas of optical frame overlap. However, the latter effects were combined nearer the central viewing area for the 25 deg overlap condition. No significant differences were noted in the supplementary air combat task as a function of overlap, but structured debriefing data indicated loss of target imagery is less of a problem with the larger overlap. It is concluded that greater than 25 deg binocular overlap should be utilized in follow-on systems. Author (GRA)

N85-17986# Boeing Military Airplane Development, Wichita, Kans.
BAFFLED EYE AND CONFOUNDED BRAIN OR USING VISUAL ILLUSIONS TO TRAIN BLIND PILOTS **c09**
R. E. Clapp *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 391-404 (For primary document see N85-17962 09-74)
(AD-P004332) Avail: NTIS HC A22/MF A01 CSCL 09/2

The extremely simplified and stylized scene construction in current computer image generation technology, together with scene dynamics shortcomings present display technology with a grossly inadequate real world simulation (one that can be truly called illusionary). Nor is current display technology in better shape. Due to confusion existing within the simulation industry over resolution of the displays, visual systems are underspecified or underdesigned by a factor of about 4 times. This is in addition to low brightness and contrast of saturated colors. If the pilot saw in the real world what he sees in the simulator he would be legally blind! These factors are discussed in some detail and possible improvements are suggested. Author (GRA)

N85-17987# Ohio State Univ., Columbus.
GLOBAL OPTICAL METRICS FOR SELF-MOTION PERCEPTION **c74**
D. H. Owen, L. Wolpert, L. J. Hettinger, and R. Warren *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 405-415 (For primary document see N85-17962 09-01)
(Contract F33615-83-K-0038)
(AD-P004333) Avail: NTIS HC A22/MF A01 CSCL 01/2

During locomotion, the entire optic array along the path of travel is continuously transformed. The nature of the transformations is informative about changes in altitude, speed, and imminence of contact with environmental surfaces. Some global optic-array variables are self scaled and some are environment scaled. By unlinking the two types of variables we have been able to empirically assess their relative usefulness for detecting change in altitude and speed. Determining the perceptual effectiveness of optical sources of information also tells us what the functional metrics are for detecting and guiding self motion. Author (GRA)

N85-17988# Naval Training Equipment Center, Orlando, Fla.
SIMULATOR SICKNESS: SENSORIMOTOR DISTURBANCES INDUCED IN FLIGHT SIMULATORS **c52**
L. H. Frank, R. S. Kennedy, M. E. McCauley, R. W. Root, and R. S. Kellogg *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 417-426 (For primary document see N85-17962 09-01)
(AD-P004334) Avail: NTIS HC A22/MF A01 CSCL 06/19

If sickness occurs in the simulator, but not in the real world, there is evidence of a bad simulation. We reviewed the available data on simulator sickness in terms of their incidence, etiology, and contributing factors. It was found that psychophysiological disturbances can occur during simulator flight, continue several hours post flight, or be delayed. Effects were found in both motion base and fixed base simulators, to pilots, other aircrew, and instructors. Simulator sickness may lead to decreased simulator use, distrust of the training received, and post effects which may place the individual at risk in real life situations such as driving a car. Adaptation, while it is known to occur, is not the answer. Adaptation to the simulator can lead to acquisition of responses which may produce negative transfer to the aircraft. Data on the relative incidence of simulator sickness in various trainers, its symptomatology, possible etiology, possible solutions and suggestions for research are discussed. Author (GRA)

N85-17989# Naval Training Equipment Center, Orlando, Fla.
ON-BOARD COMPUTER IMAGE GENERATOR (CIG) APPLICATIONS **c61**
D. R. Breglia and D. B. Coblitz *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 431-437 (For primary document see N85-17962 09-01)
(AD-P004335) Avail: NTIS HC A22/MF A01 CSCL 09/2

Current training of military pilots fails to provide the complex visual environment associated with expected combat conditions. In addition, the training systems which provide the highest fidelity to combat are not available often enough to all pilots who require maintenance of volatile combat skills. Onboard visual simulation using computer image generation is a technology which is ripe for exploitation for training. Training scenarios and development implications of onboard visual simulation are discussed. Author (GRA)

N85-17990# Rediffusion Simulation, Inc., Arlington, Tex.
CIG (COMPUTER IMAGE GENERATOR) GOES TO WAR: THE TACTICAL ILLUSION **c61**
J. B. Howie and M. A. Cosman *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 439-454 (For primary document see N85-17962 09-01)
(AD-P004336) Avail: NTIS HC A22/MF A01 CSCL 01/2

Simulation can play a decisive role in preparing pilots to survive and prevail in such a situation; however, realistic simulation of a complex multithreat tactical environment has remained an elusive goal of computer generated imagery. Current systems have been unable to present both the quantity and quality of visual cues required to train effectively in all phases of the tactical combat experience. Recent advances in CIG technology have created a system which reaches new levels of realism and effectiveness in such a task. The CT5A system can provide a dense, navigationally specific terrain model of large geographic extent, while providing a substantial reserve of processing capability which can be used to present a rich dynamic environment. Within this environment a number of ground and airborne tactical threats can be simultaneously active. Unique features within the CT5A system allow the orchestration of complex tactical effects such as missiles, cannon, tracers, flak and bomb impacts. Special modeling, shading and coloration strategies allow the presentation of very high fidelity aircraft models to support midair refueling, formation flight and target, acquisition/recognition. Many dynamic scene elements can be simultaneously active in both independent and chained motions, with proper occulting and realistic behavior maintained. We will discuss the various features of the CT5A system which make such simulations possible, and will present dynamic visual examples of these and other tactical scenarios. GRA

N85-17991# Singer Co., Lancing (England).
MILITARY APPLICATIONS OF THE SINGER LINK-MILES IMAGE VISUAL SYSTEM **c09**
D. H. Geere and T. Crampin *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 455-474 (For primary document see N85-17962 09-01)
(AD-P004337) Avail: NTIS HC A22/MF A01 CSCL 01/2

This report has discussed the evolution of the IMAGE system both from technological and human factors standpoints. The results of this approach have been to attempt optimum matching of available technologies to meet training requirements. In systems terms it is appropriate to consider the user as the LIVEWARE. Hence the ideal system is an appropriate blend of hardware, software and liveware. GRA

N85-17992# General Electric Co., Daytona Beach, Fla.
AVTS (ADVANCED VISUAL TECHNOLOGY SYSTEM): A HIGH FIDELITY VISUAL SIMULATOR **c09**
R. L. Ferguson *In* AF Human Resources Lab. The IMAGE 3 Conf.

Proc. Sep. 1984 p 455-474 (For primary document see N85-17962 09-01)
(AD-P004338) Avail: NTIS HC A22/MF A01 CSCL 01/2

The Advanced Visual Technology System (AVTS) was developed under the auspices of the Air Force human resources laboratory (AFHRL) to satisfy the demanding TACAIR mission visual system requirements. In particular, the requirement for low level flight through a high density, wide FOV, rolling terrain environment with a large number of moving models on and above the terrain surface posed a formidable system design problem. New developments were required in the critical areas of VDB structure, feature selection, priority, load management and blending to achieve the requisite scene content. This paper will discuss the advancements made in these areas, and show that an integrated system design process was essential to the success of the project. Author (GRA)

N85-17993# European Space Agency, Paris (France).
THE PRANDTL HERGESELL PROJECT OF A NATIONAL RESEARCH ESTABLISHMENT FOR AERONAUTICS
Julius C. Rotta Jun. 1984 54 p refs Transl. into ENGLISH of "Das Prandtl-Hergeseusche Projekt einer Reichsversuchsanstalt fuer Luftschiffahrt" Rept. DFVLR-Mitt-83-10 Goettingen, West Germany, Aug. 1983 Original language document announced as N84-17123
(ESA-TT-835; DFVLR-Mitt-83-10) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 18,50

A historical account on the project of a national research establishment for aeronautics in Germany is presented. The memorandum by Ludwig Prandtl and Hugo Hergesell on the project of a national research establishment for aeronautics, which was important in the founding of the German Research Establishment for Aeronautics (DUL) in 1912, is described. Developments which took place between submission of the memorandum and the date of foundation of the DUL are recounted. Author (ESA)

N85-18037# Joint Publications Research Service, Arlington, Va.
RESEARCH AT AUTOMATED ATC SCIENTIFIC-EXPERIMENTAL CENTER
T. Anodina *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 26-28 Transl. into ENGLISH from Grashdanskaya Aviatsiya (USSR), no. 11, Nov. 1984 p 44-45 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

N85-18041# Joint Publications Research Service, Arlington, Va.
NEW DISCOVERY IN SUPERSONIC FLIGHT RESEARCH
I. Novodvorskiy *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 40-41 Transl. into ENGLISH from Izvestiya (USSR), 30 Nov. 1984 p 5 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-17994 Georgia State Univ., Atlanta.
ANALYSIS OF PRESSURE GRADIENT-VELOCITY CORRELATION IN TURBULENT, PREMIXED FLAMES Ph.D. Thesis
Subhash B. S. Chandran 1984 167 p
Avail: Univ. Microfilms Order No. DA8424818

The correlation of pressure and velocity, as it occurs in turbulent stress equations is often neglected in the analysis of turbulent, reacting flows. The heat release and the ensuing dilation in reacting flows, make the measurement and modelling of these correlations difficult. An analytical study of planar, premixed flames using models for the pressure correlations and an experimental determination of these correlations in a premixed flame are done here. The models are developed by expressing pressure in terms of the velocity field. For this, a variable which depends on the pressure is defined and an equation for this variable is obtained from the momentum equation. Using the solution of this equation the pressure-velocity correlations are represented in terms of velocity correlations. The analysis of a one-dimensional, premixed, turbulent flame shows that the pressure gradient-velocity correlation term in such a flow could be of the order of the dilatation term and causes the turbulent kinetic energy to increase across the flame. Dissert. Abstr.

N85-17995 Cincinnati Univ., Ohio.
A NUMERICAL STUDY OF SEVERAL SUPERSONIC FLOWS Ph.D. Thesis
Arthur Douglas Dilley 1984 234 p
Avail: Univ. Microfilms Order No. DA8425377

Two separate supersonic flows were studied: (1) oscillations associated with shock capturing supersonic, and (2) conical flows. Two dimensional supersonic inviscid flow past compression surfaces involves a shock. If shock capturing is used, oscillations usually develop and persist. A numerical scheme is developed, using two arbitrary weight factors and contains artificial dissipation. Supersonic flow past sharp cones was examined extensively and this body geometry is used for analyzing computational methods. A new numerical scheme is developed using the Navier-Stokes equations subject to the locally conical approximation. The continuity equation and two momentum equations are solved in a coupled manner using a coupled strongly implicit (CSIP) algorithm. The normal momentum and energy equations are uncoupled, and a strongly implicit (SIP) algorithm is used to solve the energy equation for the total enthalpy. The boundary conditions are coupled implicity into the solution algorithms. The shock is fitted. Inviscid and viscous solutions for past a circular cone at small angles of attack were obtained using this scheme. Dissert. Abstr.

N85-17996 British Aerospace Aircraft Group, Kingston-upon-Thames (England).
AIR INTAKE EFFICIENCY AT ZERO SPEED AND LIP SUCTION
C. L. Bore Oct. 1984 8 p refs
(BAe-KRS-N-GEN-303) Avail: Issuing Activity

The connection between lip suction and the pressure recovery factor (efficiency) for air intakes at zero speed is examined to show the relationship between the realized lip suction force and the total pressure losses. Measurement of the lip suction force could be used as an alternative method for finding the pressure recovery factor by experiment. A rule for provision of adequate bell-mouth area for high intake efficiency is derived. Author (ESA)

N85-17997*# Old Dominion Univ., Norfolk, Va.
CORRECTIONS FOR ATTACHED SIDEWALL BOUNDARY-LAYER EFFECTS IN 2-DIMENSIONAL AIRFOIL TESTING
A. V. Murthy Washington NASA Feb. 1985 37 p refs
(Grant NAG1-334)
(NASA-CR-3873; NAS 1.26:3873) Avail: NTIS HC A03/MF A01 CSCL 01A

The problems of sidewall boundary-layer effects in airfoil testing is treated by considering the changes in the flow area due to boundary-layer thinning under the influence of the airfoil flowfield. Using von Karman's momentum integral equation, it is shown that the sidewall boundary-layer thickness in the region of the airfoil can reduce to about half the undisturbed value under the conditions prevailing in testing of supercritical airfoils. A Mach number correction due to this increased width of the flow passage is proposed. Using the small disturbance approximation, the effect of the sidewall boundary-layers is shown to be equivalent to a change in the test Mach number and also in the airfoil thickness. Comparison of the results of this approach with other similarity rules and correlation of the experimental data demonstrate the applicability of the analysis presented from low speeds to transonic speeds. Author

N85-17998# National Aerospace Lab., Tokyo (Japan).
CALCULATIONS FOR AERODYNAMIC CHARACTERISTICS ON A 3-D LIFTING BODY IN A SUBSONIC FLOW USING BOUNDARY ELEMENT METHOD
Mitsunori Yanagizawa Sep. 1984 29 p refs In JAPANESE; ENGLISH summary
(NAL-TR-835; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A boundary element method for the evaluations of steady aerodynamic loads around complex configurations in subsonic flow was developed using Green's function. Morino described the form of the integral equation, which is transformed into a set of linear algebraic equations. The velocity on the arbitrary point of the body surface is given by the derivative of the velocity potential on the point along the surface stream line. A new paneling and derivative technique is presented which can be applied to any complex configuration. To evaluate the derivative of velocity potential on the surface, the surface element is replaced with the circular arc, which is determined by three collocation points in adjoining panels. Aerodynamic quantities, such as pressure distributions, lift, pitching moment, and drag of the actual airplane in compressible flow, are calculated as an example. Comparisons between numerical and experimental results show good agreement. Author

N85-17999*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF JET EXIT VANES ON FLOW PULSATIONS IN AN OPEN-JET WIND TUNNEL
William L. Sellers, III, Zachary T. Applin, and John K. Molloy Mar. 1984 217 p refs
(NASA-TM-86299; L-15810; NAS 1.15:86299) Avail: NTIS HC A10/MF A01 CSCL 01A

An investigation was conducted of various jet exit vane configurations in the open test section of the Langley 4- by 7-Meter Tunnel to determine their effectiveness in reducing flow pulsations. The data consist of the instantaneous velocity fluctuations measured with hot-wire anemometers located at the tunnel centerline, 39.5 ft (12.0) downstream of the jet exit. The data are presented in the form of measured root-mean-square turbulence levels in the test section and a time series analysis for the baseline jet exit configuration (without vanes) and forthe most effective vane configuration, which consisted of triangular vanes alternating into and out of the flow around the jet exit. Author

N85-18000*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLOW INSTABILITIES IN TRANSONIC SMALL DISTURBANCE THEORY
Marc H. Williams (Purdue Univ., Lafayette, Indiana), Samuel R. Bland, and John W. Edwards Jan. 1985 27 p refs
(NASA-TM-86251; NAS 1.15:86251) Avail: NTIS HC A02/MF A01 CSCL 01A

The dynamics of unsteady transonic small disturbance flows about two-dimensional airfoils is examined, with emphasis on the behavior in the region where the steady state flow is nonunique. It is shown that nonuniqueness results from an extremely long time scale instability which occurs in a finite Mach number and angle of attack range. The similarity scaling rules for the instability are presented and the possibility of similar behavior in the Euler equations is discussed. Author

N85-18001*# McDonnell Aircraft Co., St. Louis, Mo.
NUMERICAL APPROACH FOR THE AERODYNAMIC ANALYSIS IF AIRFOILS WITH LAMINAR SEPARATION Final Report, Oct. 1983 - Oct. 1984
David W. Halt and Dean R. Bristow Feb. 1985 33 p refs
(NASA-CR-172496; NAS 1.26:172496) Avail: NTIS HC A03/MF A01 CSCL 01A

A numerical method for simultaneously and efficiently coupling an external subsonic potential flow and an interior viscous flow such that the two flows match at an interfacing boundary is discussed. Both a panel method and a simple point compressible vortex model are used for the outer potential field. The interior flow solvers which were used are the Navier-Stokes and Euler codes of T. J. Coakley and the Euler code of A. Verhoff. In order to test compatibility, the panel method is coupled to the less expensive Euler codes since the coupling procedure is identical with the Navier-Stokes code. The results show significant efficiency improvements can be obtained over the uncoupled approach. Results also indicate the outer potential flow is best represented by the simple point compressible vortex model. The panel method couples smoothly to Coakley's implicit code but is numerically incompatible as coupled with the explicit Euler code. An improved Navier-Stokes code is under initial development which extends the Euler code to include the necessary viscous terms. Results are shown for all infinite length channel with one wavy periodic wall with and without laminar separation. M.G.

N85-18002*# Boston Univ., Mass. Dept. of Mathematics.
A FIRST-ORDER GREEN'S FUNCTION APPROACH TO SUPERSONIC OSCILLATORY FLOW: A MIXED ANALYTIC AND NUMERIC TREATMENT
Marvin I. Freedman, Slobodan Sipcic, and Kadin Tseng Feb. 1985 38 p refs
(Contract NAG1-276)
(NASA-CR-172207; NAS 1.26:172207) Avail: NTIS HC A03/MF A01 CSCL 01A

A frequency domain Green's Function Method for unsteady supersonic potential flow around complex aircraft configurations is presented. The focus is on the supersonic range wherein the linear potential flow assumption is valid. In this range the effects of the nonlinear terms in the unsteady supersonic compressible velocity potential equation are negligible and therefore these terms will be omitted. The Green's function method is employed in order to convert the potential flow differential equation into an integral one. This integral equation is then discretized, through standard finite element technique, to yield a linear algebraic system of equations relating the unknown potential to its prescribed co-normalwash (boundary condition) on the surface of the aircraft. The arbitrary complex aircraft configuration (e.g., finite-thickness wing, wing-body-tail) is discretized into hyperboloidal (twisted quadrilateral) panels. The potential and co-normalwash are assumed to vary linearly within each panel. The long range goal is to develop a comprehensive theory for unsteady supersonic potential aerodynamic which is capable of yielding accurate results even in the low supersonic (i.e., high transonic) range. Author

N85-18003*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TRANSONIC STEADY- AND UNSTEADY-PRESSURE MEASUREMENTS ON A HIGH-ASPECT-RATIO SUPERCRITICAL-WING MODEL WITH OSCILLATING CONTROL SURFACES
Maynard C. Sandford, Rodney H. Ricketts, and F. W. Cazier, Jr. Dec. 1980 261 p refs
(NASA-TM-81888; L-13964; NAS 1.15:81888) Avail: NTIS HC A12/MF A01 CSCL 01A

A supercritical wing with an aspect ratio of 10.76 and with two trailing-edge oscillating control surfaces is described. The semispan wing is instrumented with 252 static orifices and 164 in situ dynamic-pressure gages for studying the effects of control-surface position and motion on steady- and unsteady-pressures at transonic speeds. Results from initial tests conducted in the Langley Transonic Dynamics Tunnel at two Reynolds numbers are presented in tabular form. Author

N85-18004*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUBSONIC AND TRANSONIC PRESSURE MEASUREMENTS ON A HIGH-ASPECT-RATIO SUPERCRITICAL-WING MODEL WITH OSCILLATING CONTROL SURFACES
Maynard C. Sandford, Rodney H. Ricketts, and Judith J. Watson Nov. 1981 225 p refs
(NASA-TM-83201; L-14831; NAS 1.15:83201) Avail: NTIS HC A10/MF A01 CSCL 01A

A high aspect ratio supercritical wing with oscillating control surfaces is described. The semispan wing model was instrumented with 252 static orifices and 164 in situ dynamic pressure gases

for studying the effects of control surface position and sinusoidal motion on steady and unsteady pressures. Data from the present test (this is the second in a series of tests on this model) were obtained in the Langley Transonic Dynamics Tunnel at Mach numbers of 0.60 and 0.78 and are presented in tabular form.
Author

N85-18005*# United Technologies Research Center, East Hartford, Conn.
SYNTHESIZED AIRFOIL DATA METHOD FOR PREDICTION OF DYNAMIC STALL AND UNSTEADY AIRLOADS
Santu T. Gangwani Washington NASA Feb. 1983 136 p refs (Contract NAS1-168032; DA Proj. 1L1-61103-AH-45)
(NASA-CR-3672; NAS 1.26:3672) Avail: NTIS HC A07/MF A01 CSCL 01A

A detailed analysis of dynamic stall experiments has led to a set of relatively compact analytical expressions, called synthesized unsteady airfoil data, which accurately describe in the time-domain the unsteady aerodynamic characteristics of stalled airfoils. An analytical research program was conducted to expand and improve this synthesized unsteady airfoil data method using additional available sets of unsteady airfoil data. The primary objectives were to reduce these data to synthesized form for use in rotor airload prediction analyses and to generalize the results. Unsteady drag data were synthesized which provided the basis for successful expansion of the formulation to include computation of the unsteady pressure drag of airfoils and rotor blades. Also, an improved prediction model for airfoil flow reattachment was incorporated in the method. Application of this improved unsteady aerodynamics model has resulted in an improved correlation between analytic predictions and measured full scale helicopter blade loads and stress data.
Author

N85-18006# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
GENERATION OF 3-DIMENSIONAL BODY FITTED COORDINATES USING HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS Final Report
J. L. Steger Mar. 1984 80 p
(Grant AF-AFOSR-0254-82)
(AD-A148059; AFOSR-84-1022TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

The purpose of this research has been to further develop a simple efficient grid generation procedure for external aerodynamics applications. The grid generation scheme is based on solving hyperbolic partial differential equation constraints of grid angularity and mesh incremental volumes. The grid generation scheme has been previously used in two dimensional applications to generate grids about smooth body shapes. The main thrust of this AFOSR supported research has been to extend the hyperbolic partial differential equation procedure to three dimensional applications and to study ways of applying the procedure to body shapes that have discontinuous derivatives. The main part of this report, Part 1, is devoted to describing the three dimensional hyperbolic grid generator. This Section first reviews the hyperbolic grid generation procedure in two dimensions and then describes the extension to three dimensions. Part 2 of this report is both brief and sketchy in its presentation. In this section we describe some of our successes in treating bodies with sharp edges and bodies that are exceptionally concave. The last part of this report describes a flow field algorithm development. During the course of this research we had some considerable interaction with AFWAL, and at one point became side-tracked into a successful approach of improving the efficiency of our general implicit Euler and Navier-Stokes code.
GRA

N85-18007# European Space Agency, Paris (France).
A FINITE DIFFERENCE METHOD FOR INVERSE MODE CALCULATIONS OF A THREE-DIMENSIONAL BOUNDARY LAYER
Martin Formery Sep. 1984 158 p refs Transl. into ENGLISH of "Methode aux Differences Finies pour le Calcul en Modes Inverses de la Couche Limite Turbulente Tridimensionnelle" Rept. ONERA-NT-1982-6 ONERA, Paris, 1982 Original language document announced as N84-25956
(ESA-TT-863; ONERA-NT-1982-6) Avail: NTIS HC A08/MF A01

A numerical method to solve the turbulent 3-D boundary layer equations by inverse approaches where either the longitudinal and transverse displacement thicknesses or the wall shear stress components are prescribed is proposed. The method was programmed for a boundary layer developing on a flat wall, for incompressible and compressible flows. Simple turbulence models were used. The equations are solved by a strongly implicit finite difference method. Applications in subsonic and transonic flows show that a separation is crossed without numerical difficulty, and that it is possible to extend the calculation of the boundary layer in the separated zone and beyond the reattachment line. Results agree with experimental data; the flow structure in the vicinity of the separation line is faithfully represented.
Author (ESA)

N85-18008# Rolls-Royce Ltd., Derby (England).
LAMINAR SEPARATION BUBBLE WITH TRANSITION: PREDICTION TEST WITH LOCAL INTERACTION
C. Gleyzes (ONERA, Toulouse), J. Cousteix (ONERA, Toulouse), and J. L. Bonnet (ONERA, Toulouse) 8 Nov. 1984 30 p refs (PNR-90231; Trans-16569/TLT-00917) Avail: NTIS HC A03/MF A01

A leading edge separation bubble on a peaky airfoil was studied. Boundary layer measurements, mean volocity and longitudinal turbulence intensity were recorded at Reynolds numbers between 100,000 and 1 million. The transition process in a long bubble was also studied. Calculation methods applicable to short bubbles based on a local viscid-inviscid interaction scheme are proposed. The development of the boundary layer downstream of the laminar separation bubble with transition is defined although the size of the profile prevented detailed results for the actual short bubble.
Author (ESA)

N85-17939# Lockheed Missiles and Space Co., Sunnyvale, Calif.
WING ROCK FLOW PHENOMENA
L. E. Ericsson *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 10-20 (For primary document see N85-17937 09-01)
(AD-P004154) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17941# United Technologies Research Center, East Hartford, Conn.
UNSTEADY STALL PENETRATION OF AN OSCILLATING SWEPT WING
F. O. Carta *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 28-37 (For primary document see N85-17937 09-01)
(AD-P004156) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17942# Southwest Research Inst., San Antonio, Tex.
SIMULTANEOUS FLOW VISUALIZATION AND UNSTEADY LIFT MEASUREMENT ON AN OSCILLATING LIFTING SURFACE
R. L. Bass, J. E. Johnson, and J. F. Unruh *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 38-44 (For primary document see N85-17937 09-01)
(AD-P004157) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17943# Flow Research, Inc., Kent, Wash.
A VISUAL STUDY OF A DELTA WING IN STEADY AND UNSTEADY MOTION
M. Gad-el-Hak, C. M. Ho, and R. F. Blackwelder *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 45-51 (For primary document see N85-17937 09-01)
(Contract F49620-82-C-0020)
(AD-P004158) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17947# Colorado Univ., Boulder.
UNSTEADY AERODYNAMIC LOADING OF AN AIRFOIL DUE TO VORTICES RELEASED INTERMITTENTLY FROM ITS UPPER SURFACE
C. Y. Chow and C. S. Chiu *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 76-81 (For primary document see N85-17937 09-01)

(Contract F49620-83-K-0009)
(AD-P004162) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17948*# Scientific Research Associates, Inc., Glastonbury, Conn.
A NAVIER-STOKES CALCULATION OF THE AIRFOIL DYNAMIC STALL PROCESS
S. J. Shamroth *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 82-89 (For primary document see N85-17937 09-01)
(Contract NAS1-15214)
(AD-P004163) Avail: NTIS HC A09/MF A01 CSCL 20D

N85-17950# McDonnell-Douglas Corp., Long Beach, Calif. Aircraft Div.
CAN THE SINGULARITY BE REMOVED IN TIME-DEPENDENT FLOWS?
T. Cebeci, A. A. Khattab, and S. M. Schimke *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 97-105 (For primary document see N85-17937 09-01)
(Contract F49620-82-C-0055)
(AD-P004165) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17952# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.
UNSTEADY SEPARATED FLOW: FORCED AND COMMON VORTICITY ABOUT OSCILLATING AIRFOILS
M. C. Robinson and M. W. Luttges *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 117-126 (For primary document see N85-17937 09-01)
(Grant AF-AFOSR-0037-81)
(AD-P004167) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17953# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.
UNSTEADY SEPARATED FLOWS: GENERATION AND USE BY INSECTS
M. W. Luttges, C. Somps, M. Kliss, and M. Robinson *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 127-136 (For primary document see N85-17937 09-01)
(AD-P004168) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17954# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
THEORETICAL STUDY OF NON-LINEAR UNSTEADY AERODYNAMICS OF A NON-RIGID LIFTING BODY
J. C. Wu, N. L. Sankar, and H. H. Chen *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 137-147 (For primary document see N85-17937 09-01)
(Grant AF-AFOSR-0108-82)
(AD-P004169) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17955# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THEORETICAL INVESTIGATION OF DYNAMIC STALL USING A MOMENTUM INTEGRAL METHOD
E. J. Jumper and J. E. Hitchcock *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 148-151 (For primary document see N85-17937 09-01)
(AD-P004170) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17956# Texas Technological Univ., Lubbock.
PRELIMINARY RESULTS FROM THE UNSTEADY AIRFOIL MODEL USTAR2
J. H. Strickland, J. W. Oler, and B. J. Im *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 152-157 (For primary document see N85-17937 09-01)
(Grants AF-AFOSR-1218-74; AF-AFOSR-3727-52)
(AD-P004171) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17959# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
FLOW SEPARATION INDUCED BY PERIODIC AERODYNAMIC INTERFERENCE
E. E. Covert, P. F. Lorber, and C. M. Vaczy *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 169-176 (For primary document see N85-17937 09-01)
(Grant AF-AFOSR-0282-80)
(AD-P004174) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17960# Vehicle Research Corp., Pasadena, Calif.
LEADING EDGE SEPARATION CRITERION FOR AN OSCILLATING AIRFOIL
E. C. James *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 177-183 (For primary document see N85-17937 09-01)
(Contract F49620-82-C-0038)
(AD-P004175) Avail: NTIS HC A09/MF A01 CSCL 20/4

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-18009*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLIGHT TRAINING TECHNOLOGY FOR REGIONAL/COMMUTER AIRLINE OPERATIONS: REGIONAL AIRLINE ASSOCIATION/NASA WORKSHOP PROCEEDINGS
Alfred T. Lee, ed. and John K. Lauber, ed. Dec. 1984 253 p refs Workshop held at Moffett Field, Calif., 28-30 Sep. 1983
(NASA-CP-2348; A-9863; NAS 1.55:2348) Avail: NTIS HC A12/MF A01 CSCL 05I

Programs which have been developed for training commercial airline pilots and flight crews are discussed. The concept of cockpit resource management and the concomitant issues of management techniques, interpersonal communication, psychological factors, and flight stress are addressed. Training devices and simulation techniques are reported. For individual titles, see N85-18010 through N85-18028.

N85-18010*# Seville Training Systems Corp., Pensacola, Fla.
FLIGHT CREW TRAINING TECHNOLOGY: A REVIEW c53
Paul W. Caro *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 9-39 refs (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

The process of flight crew training is emphasized herein. Flight simulators and other training equipment are discussed, but the point is made that such equipment does not constitute the training process in its entirety. The development of flight training technology is traced from the period prior to World War I to the present. Computer generated imagery in flight simulation is addressed. R.S.F.

N85-18011*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LOW-COST TRAINING TECHNOLOGY c53
Alfred T. Lee *In its* Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 41-55 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

The differences between flight training technology and flight simulation technology are highlighted. Examples of training technologies are provided, including the Navy's training system and the interactive cockpit training device. Training problems that might arise in the near future are discussed. These challenges follow from the increased amount and variety of information that a pilot must have access to in the cockpit. R.S.F.

N85-18012*# USAir, Pittsburgh, Pa.
CAPTAIN DEVELOPMENT TRAINING AT US AIR c53
Stan Fickes *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 57-77 (For primary document see N85-18009 09-03)

Avail: NTIS HC A12/MF A01 CSCL 05I

The flight training program practiced at US Air is reviewed. The background and development of the program are discussed. Specific program activities and curricula are considered. The issue of educating pilots to be aware of and admit significant flight stress and stress in their personal lives is addressed. R.S.F.

N85-18013*# Piedmont Aviation, Inc., Winston-Salem, N. C.
MANAGEMENT TRAINING FOR COCKPIT CREWS AT PIEDMONT FLIGHT c53
J. C. Sifford *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 79-101 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

A brief history of Piedmont Airlines' flight operations is presented. A captain-management seminar conducted regularly by Piedmont is discussed. Piedmont's approach to cockpit resource management (CRM) is reviewed, and the relationship of CRM training to other aspects of flight training is addressed. Future leadership research plans and CRM training is considered along with critical training issues. R.S.F.

N85-18014*# United Air Lines, Inc., Chicago, Ill.
INTEGRATED APPROACH TO FLIGHT CREW TRAINING c53
J. E. Carroll *In* NASA. Ames Research Center Flight Training Technol for Regional/Commuter Airline Operations Dec. 1984 p 103-119 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

The computer based approach used by United Airlines for flight training is discussed. The human factors involved in specific aircraft accidents are addressed. Flight crew interaction and communication as they relate to training and flight safety are considered. R.S.F.

N85-18015*# Pennsylvania Airlines, Middletown.
VIDEO CONCEPTS IN CRM TRAINING c53
Mike Yocum *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 123-135 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

Cockpit resource management (CRM) is discussed in the context of programs developed by Pennsylvania Airlines and Ransome Airlines. Video techniques in flight training are emphasized. Problems in cockpit interpersonal communication are addressed. R.S.F.

N85-18016*# Metro Air, Ronkonkoma, N.Y.
USE OF SIMPLIFIER SCENARIOS FOR CRM TRAINING c53
Dan Weatherly *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 137-142 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

Cockpit resource management (CRM) at Metro Airlines is discussed. The process by which the program of CRM training was initiated is mentioned. Management aspects of various flying scenarios are considered. The transfer of training from the classroom to the field is assessed. R.S.F.

N85-18017*# Air Midwest, Inc., Wichita, Kans.
COMMUNICATIONS SKILLS FOR CRM TRAINING c53
Martin Shearer *In* NASA. Ames Research Center Flight Training Technql. for Regional/Commuter Airline Operations Dec. 1984 p 143-146 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

A pilot training program in communication skills, listening, conflict solving, and task orientation, for a small but growing commuter airline is discussed. The interactions between pilots and management, and communication among crew members are examined. Methods for improvement of cockpit behavior management personnel relations are investigated. E.A.K.

N85-18018*# Scenic Air Lines, Inc., Las Vegas, Nev.
DYNAMIC TRAINING DEVICES IN CRM TRAINING c53
James Lawver *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 147-153 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

Pilot training effectiveness and flying safety of a seasonal tour flight company are described. The change from single pilot to two pilot operated twin otters is examined. The use of the ATC 810 training device, its possibilities and training capacity is outlined. Problem areas which may arise, emergency system and pilot/passenger interaction are analyzed. E.A.K.

N85-18019*# Air Wisconsin, Inc., Appleton.
USE OF AIRPLANES FOR LOFT TRAINING c53
Mike Sele *In* NASA. Ames Research Center Flight Training for Regional/Commuter Airline Operations Dec. 1984 p 155-157 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

The use of an aircraft for line oriented flight training (LOFT) is examined. Cockpit resource management (CRM) and LOFT training are compared. The advantages of the LOFT is a better cost effectiveness since there is no need to buy a simulator. The flight crew workload can be limited to a minimum. E.A.K.

N85-18020*# Flight Safety Foundation, Inc., Arlington, Va.
SAFETY AWARENESS, PILOT EDUCATION, AND INCIDENT REPORTING PROGRAMS
John Enders *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 159-170 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 01C

Education in safety awareness, pilot training, and accident reporting is discussed. Safety awareness and risk management are examined. Both quantitative and qualitive risk management are explored. Information dissemination on safety is considered. E.A.K.

N85-18021*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE AVIATION SAFETY REPORTING SYSTEM
W. D. Reynard *In its* Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 171-180 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 01C

The aviation safety reporting system, an accident reporting system, is presented. The system identifies deficiencies and discrepancies and the data it provides are used for long term identification of problems. Data for planning and policy making are provided. The system offers training in safety education to pilots. Data and information are drawn from the available data bases. E.A.K.

N85-18022*# Harvard Univ., Cambridge, Mass.
COCKPIT RESOURCES MANAGEMENT AND THE THEORY OF THE SITUATION
Lee Bolman *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 181-197 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 01C

The cockpit resource management (CRM) and hypothetical cockpit situations are discussed. Four different conditions which influence pilot action are outlined: (1) wrong assumptions about a situation; (2) stress and workload; (3) frustration and delays to cause risk taking; and (4) ambigious incomplete or contradicting information. Human factors and behavior, and pilot communication and management in the simulator are outlined. E.A.K.

N85-18023*# Pennsylvania Airlines, Middletown.
COCKPIT RESOURCE MANAGEMENT TRAINING
Mike Yocum and Clay Foushee *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 201-210 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 01C

Cockpit resource management which is a multifaceted concept

is outlined. The system involves the effective coordination of many resources: aircraft systems, company, air traffic control, equipment, navigational aids, documents, and manuals. The main concept, however, is group interaction. Problems which arise from lack of coordination, decision making, and lack of communication are pointed out. Implementation by the regional airline industry of cockpit resource management, designed to deal with human interactions problems in the most cost effective manner, is discussed. E.A.K.

N85-18024*# Ransome Airlines, Philadelphia, Pa.
SIMULATION **c53**
Frank Foster and Robert Randle *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 211-219 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

The application of flight simulation in regional airline training programs is discussed. Specifically, the use of simulation in cockpit resources management training (CRMT) is investigated. The availability of simulation resources is explored and the simulator disadvantages and advantages are cited. Problems with simulator specification, procurement, validation and use that have plagued the major air carriers over several decades are addressed. B.W.

N85-18025*# Scenic Air Lines, Inc., Las Vegas, Nev.
LOW COST TRAINING AIDS AND DEVICES **c53**
Jim Lawver and Al Lee *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 221-228 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

The need for advanced flight simulators for two engine aircraft is discussed. Cost effectiveness is a major requirement. Other training aids available for increased effectiveness are recommended. Training aids include: (1) audio-visual slides; (2) information transfer; (3) programmed instruction; and (4) interactive training systems. B.W.

N85-18026*# Air Midwest, Inc., Wichita, Kans.
PILOT EDUCATION AND SAFETY AWARENESS PROGRAMS
Martin Shearer and W. D. Reynard *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 229-239 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 01C

Guidelines necessary for the implementation of safety awareness programs for commuter airlines are discussed. A safety office can be viewed as fulfilling either an education and training function or a quality assurance function. Issues such as management structure, motivation, and cost limitations are discussed. B.W.

N85-18027*# Air Wisconsin, Inc., Appleton.
INITIATIVE USES OF AIRCRAFT FOR FLIGHT TRAINING
Mike Sele and Mike Baetge *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 241-247 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 01C

The use of the aircraft rather than a flight simulator as a training device is investigated. Particular attention is paid to the application of LOFT concepts to the aircraft in its home environment. B.W.

N85-18028*# Command Airways, Wappingers Falls, N.Y.
INNOVATIVE APPROACHES TO RECURRENT TRAINING **c53**
Hank Noon and Miles Murphy *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 249-263 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

Innovative approaches to recurrent training for regional airline aircrews are explored. Guidelines for recurrent training programs which include in corporation of cockpit resource management are discussed. B.W.

N85-18029# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.
ANALYTICAL MODELING OF A POLLING PROTOCOL [MODELISATION ANALYTIQUE D'UN PROTOCOLE DE POLLING]
Francois Ougier 27 Jun. 1984 60 p refs In FRENCH
(ENST-84H001; ISSN-0751-1361) Avail: NTIS HC A04/MF A01

Polling protocols for an airline operations information network were analyzed. A waiting time formula was derived from an analytical model of a polling protocol. An algorithm for obtaining the distribution of waiting time from a computer was developed. Test results show that a fast modem performs more poorly than a slow one. Author (ESA)

N85-18030# Transportation Research Board, Washington, D.C.
ISSUES IN AIR TRANSPORT
Juan C. OCallahan, Donald J. Bennett, G. Russell Morrissey, Douglas S. McLeod, Ralph D. Sandler, Edward T. Denham, John Blair, Mark L. Ford, Rosalyn Shirack, and Maximilian M. Etschmaier 1984 59 p refs
(PB85-121374/GAR; TRB/TRR-958; ISBN-0-309-03704-2; LC-84-22804) Avail: NTIS HC A04/MF A01 CSCL 01B

Some probable effects of deregulation on airline industry economics; discount fare market research, 1981 to 1983; airline cost trends as viewed by an airframe manufacturer; economic impact of general aviation in Florida: suggested method of analysis; estimating aircraft activity at nontowered airports: results of the aircraft activity counter demonstration projects; mission-oriented maintenance for military aircraft and implications for public transportation fleet maintenance; a model for determining the width of airport pedestrain corridors; and, aviation legislation and infrastructure: policy implications for the 1980s are discussed. GRA

N85-18031# Factory Mutual Research Corp., Norwood, Mass.
MODELING OF AIRCRAFT CABIN FIRES
Michael A. Delichatsios Sep. 1984 116 p refs Sponsored in part by FAA
(Grant NB82-NADA-3041)
(PB85-137685/GAR; FMRC-J-I-OHOJ2-BU1; NBS/GCR-84/473) Avail: NTIS HC A06/MF A01 CSCL 13L

Simple fire dynamic models for various components of an aircraft cabin fire are developed. These simple integral models can be incorporated in global zone models for aircraft cabin fires occurring in flight or caused by an impact-survivable crash. The major accomplishment was the development of simple expressions for the burning of vertical walls, simulating, for example, the burning of wall panels in the fuselage. Flame heights of vertical wall fires are predicted and correlated by a simple expression. In addition, critical conditions for extinction of rapid flame spread were investigated for fires in vertical walls consisting of charring materials, allowing for the prediction of flame spread rates. Author (GRA)

N85-18032# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
12 Feb. 1985 118 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-85-003) Avail: NTIS HC A06/MF A01

Transportation in the USSR is discussed, with particular emphasis on civil aviation, motor vehicles and highways, and rail systems. In addition, maritime and river fleets, ports and transshipment centers, and intersector network development are considered. For individual titles, see N85-18033 through N85-18041.

N85-18033# Joint Publications Research Service, Arlington, Va.
FIRST DEPUTY MINISTER ON 1984 CIVIL AVIATION PERFORMANCE
In its USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 1-2 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 27 Dec. 1984 p 2 (For primary document see N85-18032

09-03)
Avail: NTIS HC A06/MF A01

The activities of Aeroflot in 1984 are summarized. Air service between the Soviet Union and other countries is discussed together with air service within the USSR. In addition to passenger transportation, the role of civil aviation in working out the food program of the USSR is mentioned. R.S.F.

N85-18034# Joint Publications Research Service, Arlington, Va.
COLLEGIUM ON AVIATION FUEL CONSERVATION EFFORTS c05
In its USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 3-4 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 1 Dec. 1984 p 2 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

Reduction in the consumption levels of fuel by Soviet civil aviation is addressed. Methods proposed to economize aircraft fuel include: the introduction of towing to the runup area, keeping aircraft surfaces in good condition by washing, ensuring the stability of engine operating characteristics by flushing out gas and air lines, using ground-based conditioners and equipment of ramps with ground-based sources of electricity to reduce the operation of auxiliary power plants, replacement of heat engines for clearing runways of snow and ice by the introduction of snowplows with blowers, introduction of machinery with infrared lighting, and broader application of chemical reagents. R.S.F.

N85-18035# Joint Publications Research Service, Arlington, Va.
FINNAIR, LOT, SAS REPS IN USSR ON PRESENT OPERATIONS, PLANS
In its USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 15-18 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 29 Dec. 1984 p 4 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

The operations and plans of Finnair (Finland), LOT (Poland), and SAS (Denmark/Norway/Sweden) airlines are discussed. R.S.F.

N85-18036# Joint Publications Research Service, Arlington, Va.
ACTIVITIES AT MIL EXPERIMENTAL DESIGN BUREAU c05
A. Gorokhov *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 21-25 Transl. into ENGLISH from Pravda (USSR), 22 Nov. 1984 p 6 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

Activities at the OKB design facility and flight test complex are reported. R.S.F.

N85-18037# Joint Publications Research Service, Arlington, Va.
RESEARCH AT AUTOMATED ATC SCIENTIFIC-EXPERIMENTAL CENTER c01
T. Anodina *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 26-28 Transl. into ENGLISH from Grashdanskaya Aviatsiya (USSR), no. 11, Nov. 1984 p 44-45 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

Air traffic control systems improvements discussed include: radar; communication equipment; microwave equipment; workloads; navigation aids; and flight simulation B.G.

N85-18038# Joint Publications Research Service, Arlington, Va.
AIRPORT GROUND EQUIPMENT UNDER DEVELOPMENT AT RIGA c09
I. Afanasyev *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 29-30 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 27 Nov. 1984 p 2 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

The quality of ground support equipment at airports is discussed. The complexity of design and the degree of automation of industrial processes is growing and the work loads are increasing. Under these conditions the need for reliable mechanisms is crucial. Methods to improve productivity are discussed. B.G.

N85-18039# Joint Publications Research Service, Arlington, Va.
IMPROVEMENTS IN KAZAN AIRPORT EQUIPMENT, FACILITIES c09
Y. Tsipin *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 34-36 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 29 Nov. 1984 p 3 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

Improvement of equipment reliability and dependability at Kazan Airport is discussed. Adoption of an automatic landing circle control service should free the air traffic controller from superfluous mechanical work and focus his attention on air traffic control. B.G.

N85-18040# Joint Publications Research Service, Arlington, Va.
IMPROVEMENTS UNDER WAY AT GORKIY AIRPORT c09
V. Deberdeyev *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 37-39 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 4 Dec. 1984 p 1 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

Improvements at Gorkiy Airport consist of the following: approach, landing, and take-off console controls; special fuel lines; new light signaling equipment; a second runway; and lengthening the existing runway. B.G.

N85-18041# Joint Publications Research Service, Arlington, Va.
NEW DISCOVERY IN SUPERSONIC FLIGHT RESEARCH c01
I. Novodvorskiy *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 40-41 Transl. into ENGLISH from Izvestiya (USSR), 30 Nov. 1984 p 5 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

Compressibility and viscosity are important characteristics in supersonic aviation. At high speed the flow-past becomes turbulent and separating flows appear. These separated flows most often produce undesirable effects; especially an increase in drag. Experimental data is used to explain these effects. B.G.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-18042# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
THREE POSITION ESTIMATION PROCEDURES
R. N. Forrest Jun. 1984 25 p
(AD-A148748; NPS55-84-13) Avail: NTIS HC A02/MF A01 CSCL 17/3

This report describes three position estimation procedures. The first is for estimates based on bearings taken on or from stations with uncertain locations. The second is for use with two or more lines of position. The third is combining estimates from different sources. GRA

N85-18043# Sandia Labs., Albuquerque, N. Mex.
AUTOMATIC LAND VEHICLE NAVIGATION USING ROAD MAP DATA
R. Schindwolf Jun. 1984 21 p refs
(Contract DE-AC04-76DP-00789)
(DE84-017178; SAND-84-0838) Avail: NTIS HC A02/MF A01

A land navigation system has been developed that provides accurate navigation data while it is traveling on mapped roads.

The system is autonomous and consists of a simple dead-reckoning navigator that is updated with stored road map data. Simulation and preliminary test results indicate that accuracies on the order of 50 feet can be achieved. Accuracy is independent of time. DOE

N85-18044# Ecole Nationale Superieure des Telecommunications, Paris (France).
DESIGN AND REALIZATION OF A MULTIRADAR TRACKING SYSTEM FOR AIR TRAFFIC CONTROL Ph.D. Thesis [CONCEPTION ET REALISATION D'UN SYSTEME DE POURSUITE MULTIRADAR POUR LE CONTROLE DU TRAFIC AERIEN]
Georges Tsaknakis 22 Jun. 1984 212 p refs In FRENCH
(ENST-84E010; ISSN-0751-1358) Avail: NTIS HC A10/MF A01

The variable update method was implemented in a minicomputer controlled multiradar tracking system for air traffic control. Algorithms for plot-path correlation, maneuver detection, path initialization, and plot dating were developed. An isotropic Kalman X-Y filter with an algorithm for following evolutions was derived. Comparison with classic multiradar tracking methods shows that the variable update method gives improved results with standard hardware. Author (ESA)

N85-18045# National Oceanic and Atmospheric Administration, Boulder, Colo. Program for Regional Observing and Forecasting Services.
DENVER ARTCC (AIR ROUTE TRAFFIC CONTROL CENTER) EVALUATION OF PROFS (PROGRAM FOR REGIONAL OBSERVING AND FORECASTING SERVICES) MESOSCALE WEATHER PRODUCTS
Fred Foss and John W. Hinkelman, Jr. Jan. 1984 84 p refs Prepared in cooperation with Denver Air Route Traffic Control Center, Longmont, Colo. Sponsored in part by FAA
(PB85-120301/GAR) Avail: NTIS HC A05/MF A01 CSCL 17G

This project was initiated in April 1982 at the request of the Denver Air Route Traffic Control Center to help alleviate the serious impact on the entire air traffic control (ATC) system of adverse weather situations at centrally located Denver Stapleton International Airport. There are four major weather problems at Stapleton: severe thunderstorms, wind shear resulting from convection, upslope clouds and precipitation with deteriorating ceiling and visibility conditions, and wind shifts. To help forecasters detect, analyze and forecast these, the Program for Regional Observing and Forecasting Services (PROFS) provided real time high resolution data sets: conventional Weather Service radar (WSR) data, automated mesoscale surface observations, and 20 minute winds aloft vertical profiles. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-18046 Kansas Univ., Lawrence.
A FEASIBILITY STUDY OF FREE-TIP ROTOR APPLICATION AS A PASSIVE CYCLIC CONTROL DEVICE Ph.D. Thesis
Hiroyuki Kumagai 1984 225 p
Avail: Univ. Microfilms Order No. DA8424287

A feasibility study of a passive device which provides a cyclic longitudinal control moment for a helicopter rotor was performed utilizing a rotor blade tip which is structurally decoupled from the blade inboard section. This rotor configuration is generally called Free Tip Rotor. A two dimensional numerical model was used to review the constant lift tip rotor, a predecessor of the current configurations, and then the same model was applied to the passive cyclic control device. Both configurations showed a high potential to improve the helicopter performance. A rotor performance analysis was performed by a three dimensional numerical model, originally developed by Boeing Vertol Company. It indicated that the vortices shed from the junction between the tip and the inboard section has a strong influence on the tip, and it may severely limit the tip performance. Dissert. Abstr.

N85-18047 Kansas Univ., Lawrence.
MODELING OF AIRCRAFT PERFORMANCE FROM FLIGHT TEST RESULTS USING QUASI STEADY-STATE TEST TECHNIQUES Ph.D. Thesis
Thomas Richard Yechout 1984 436 p
Avail: Univ. Microfilms Order No. DA8424288

The development, implementation and flight test evaluation of a performance modeling technique which required a limited amount of quasi steady-state flight test data to predict the overall one g performance characteristics of an aircraft are described. The concept definition phase of the program included development of: (1) the relationships for defining aerodynamic characteristics from quasi steady-state maneuvers; (2) a simplified in-flight thrust and airflow prediction technique; (3) a flight test maneuvering sequence which efficiently provided definition of baseline aerodynamic and engine characteristics including power effects on life and drag; and (4) the algorithms necessary for cruise and flight trajectory predictions. Implementation of the concept included design of the overall flight test data flow, definition of instrumentation system and ground test requirements, development and verifications of all applicable software and consolidation of the overall requirements in a flight test plan. Performance modeling technology was developed to the point that it is ready for use in a wide range of flight test programs. Dissert. Abstr.

N85-18048 British Aerospace Aircraft Group, Kingston-upon-Thames (England).
WHY VERTICAL LANDING
J. F. Farley 16 Feb. 1984 13 p
(BAe-KRS-N-GEN-301) Avail: Issuing Activity

It is argued that vertical landing is better than short landing because it is easier for the pilot, is inherently safer for pilot and aircraft, and gives the greatest possible operational flexibility in choosing a landing site, including the use of ships. It allows safe peacetime training of the realistic operational case. It has better allowable limits of cloud base, visibility, crosswind and turbulence. It allows a safe landing in the presence of aircraft defects that prevent controlled short landings. If combat damage is suspected the serviceability of all necessary aircraft systems can be fully checked before the landing. Author (ESA)

N85-18049*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ICING FLIGHT RESEARCH: AERODYNAMIC EFFECTS OF ICE AND ICE SHAPE DOCUMENTATION WITH STEREO PHOTOGRAPHY
Kevin L. Mikkelsen, Robert C. McKnight, Richard J. Ranaudo, and Porter J. Perkins, Jr. (Sverdrup Technology, Inc., Middleburg Heights, Ohio) 1985 32 p refs Presented at the 23rd Aerospace Sci. Meeting, Reno, Nevada, 14-17 Jan. 1985; sponsored by AIAA
(NASA-TM-86906; E-2395; NAS 1.15:86906; AIAA-85-0468) Avail: NTIS HC A03/MF A01 CSCL 01C

Aircraft icing flight research was performed in natural icing conditions. A data base consisting of icing cloud measurements, ice shapes, and aerodynamic measurements is being developed. During research icing encounters the icing cloud was continuously measured. After the encounter, the ice accretion shapes on the wing were documented with a stereo camera system. The increase in wing section drag was measured with a wake survey probe. The overall aircraft performance loss in terms of lift and drag coefficient changes was obtained by steady level speed/power measurements. Selective deicing of the airframe components was performed to determine their contributions to the total drag increase. Engine out capability in terms of power available was analyzed for the iced aircraft. It was shown that the stereo photography system can be used to document ice shapes in flight and that the wake survey probe can measure increases in wing section drag caused by ice. On one flight, the wing section drag coefficient (c sub d) increased approximately 120 percent over

the uniced baseline at an aircraft angle of attack of 6 deg. On another flight, the aircraft darg coefficient (c sub d) increased by 75 percent over the uniced baseline at an aircraft lift coefficient (C sub d) of 0.5. Author

N85-18050# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.
THE DEVELOPMENT OF A DYNAMIC MODEL OF A GENERALISED COMBAT AIRCRAFT WITH FORWARD WINGS FOR THE IDENTIFICATION OF STABILITY AND CONTROL CHARACTERISTICS
F. Heydari and M. V. Cook Oct. 1984 144 p refs Sponsored by RAE
(CAR-8433) Avail: NTIS HC A07/MF A01

A forward swept wing aircraft was designed theoretically and then dynamically scaled down to suit the Weybridge wind tunnel facility. The model is then made to fly in four degrees of freedom, namely, pitch, yaw, roll and vertically up and down. Transient response of this model to dipole deflection of the canard, ailerons or rudder are recorded in the computer memory after digitization through an interface. Later, these data are read from the memory into the extended Kalman filter program together with the estimates of relevant aerodynamic derivatives serving as initial values. The output, provided the filter does not diverge, would be the identified aerodynamic derivative parameters. The confidence level can then be checked by inserting these values into a simulation program written in ACSL. The transient response of this simulated model is then checked against the experimental one. If the two traces coincide, it can be said that the values of identified parameter are close to the actual values. Author

N85-18051*# Boeing Vertol Co., Philadelphia, Pa.
INTEGRATED TECHNOLOGY ROTOR/FLIGHT RESEARCH ROTOR HUB CONCEPT DEFINITION
Peter G. C. Dixon Mar. 1983 219 p refs
(Contract DAAK51-81-C-0027)
(NASA-CR-166447; NAS 1.26:166447; USAAVRADCOM-TR-83-A-3; D210-11964-1) Avail: NTIS HC A10/MF A01 CSCL 01C

Two variations of the helicopter bearingless main rotor hub concept are proposed as bases for further development in the preliminary design phase of the Integrated Technology Rotor/Flight Research Rotor (ITR/FRR) program. This selection was the result of an evaluation of three bearingless hub concepts and two articulated hub concepts with elastomeric bearings. The characteristics of each concept were evaluated by means of simplified methodology. These characteristics included the assessment of stability, vulnerability, weight, drag, cost, stiffness, fatigue life, maintainability, and reliability. B.G.

N85-18052# Aeronautical Research Labs., Melbourne (Australia).
A COMPARISON OF FATIGUE LIVES UNDER A COMPLEX AND A MUCH SIMPLIFIED FLIGHT-BY-FLIGHT TESTING SEQUENCE
J. Y. Mann and G. W. Revill Aug. 1984 35 p refs
(ARL/Struc-TM-388; AR-003-954) Avail: NTIS HC A03/MF A01

Flight-by-flight fatigue tests were carried out on specimens representing part of the front flange of the main spar of the Mirage 3 wing. Two loading spectra/loading sequences were used, the first being a 200-flight sequence incorporating 24 different types of flight developed by the Eidgenossisches Flugzeugwerk in Switzerland and the second a much simplified 100-flight sequence incorporating only 4 different types of flight developed by Avions Marcel Dassault in France. The fatigue tests show no significant differences in the lives to failure between specimens tested under the two sequences. It was concluded that the use of the simplified stress spectrum/sequence would not have invalidated the findings of a previous investigation to develop life-enhancement procedures for the Mirage wing main spar. Author

N85-18053# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio. Design Branch.
BI-PAC F-15 EXTERNAL FUEL TANK CONTAINER MODIFICATION
Edward J. Kowalski Sep. 1984 25 p
(AD-A148836; PTPD-84-R-02) Avail: NTIS HC A02/MF A01 CSCL 13/4

A request was made to test and evaluate BI-PAC Fiberglass Containers, NSN 1560-01-017-0858FX, used for shipment/storage of F-15, 600-gallon external fuel tanks. Reports from WR-ALC/DSTD indicated that damage was occurring to the fuel tanks while in transit. Inspection and evaluation by AFPEA revealed a need for container modifications. Tie-down rings, stacking posts, restraint bars, and stowage positions of these items were modified. Results of the in-house testing indicate that the F-15, 600-gallon external fuel tanks can be shipped safely in the modified BI-PAC containers. GRA

N85-18054# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
A LITERATURE SURVEY OF GROUND LOAD STATISTICS FOR LANDING GEAR FATIGUE DESIGN PURPOSES
Anders I. Gustavsson Aug. 1984 36 p refs
(Contract STU-81-4626B)
(FFA-TN-1984-39) Avail: NTIS HC A03/MF A01

Statistics of ground and landing gear loads, including measurements of accelerations at the center of gravity and measurements with strain gages applied to the landing gear are surveyed. The landing impact is the most thoroughly studied, especially with the normal acceleration recorded. The least information available is for single events such as braking, towing and pivoting. Author (ESA)

N85-17938# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
SUPERMANEUVERABILITY
W. B. Herbst *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 1-9 (For primary document see N85-17937 09-01)
(AD-P004153) Avail: NTIS HC A09/MF A01 CSCL 01/2

N85-17945# Analytical Methods, Inc., Redmond, Wash.
PREDICTION OF DYNAMIC STALL CHARACTERISTICS USING ADVANCED NONLINEAR PANEL METHODS
B. Maskew and F. A. Dvorak *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 58-72 (For primary document see N85-17937 09-01)
(Contract F49620-82-C-0019)
(AD-P004160) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-18034# Joint Publications Research Service, Arlington, Va.
COLLEGIUM ON AVIATION FUEL CONSERVATION EFFORTS
In its USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 3-4 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 1 Dec. 1984 p 2 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

N85-18036# Joint Publications Research Service, Arlington, Va.
ACTIVITIES AT MIL EXPERIMENTAL DESIGN BUREAU
A. Gorokhov *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 21-25 Transl. into ENGLISH from Pravda (USSR), 22 Nov. 1984 p 6 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

N85-18223# Joint Publications Research Service, Arlington, Va.
ON SOLVING NONLINEAR PROBLEMS OF AIRCRAFT STRUCTURAL MECHANICAL DESIGN Abstract Only
S. K. Chernikov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 33-34 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 105-107 Original language document was announced in IAA as A84-25584 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-18055# Army Aeromedical Research Lab., Fort Rucker, Ala.
THE EFFECT OF MODIFIED SPECTACLES ON THE FIELD OF VIEW OF THE HELMET DISPLAY UNIT OF THE INTEGRATED HELMET AND DISPLAY SIGHTING SYSTEM
W. E. McLean and C. E. Rash Sep. 1984 34 p
(AD-A148693; USAARL-84-12) Avail: NTIS HC A03/MF A01 CSCL 17/8

A study was conducted to establish the effect of wearing modified aviator spectacles, either for laser protection or refractive error correction, on the field-of-view available with the Helmet Display Unit (HDU) of the Integrated Helmet and Display Sighting System (IHADSS). The determining factors of the available field were found to be helmet fit, eye fixation direction, and eye relief distance. The study concluded that when these factors are optimized, the wearing of the modified spectacles does not result in a loss of field-of-view. GRA

N85-17984# CAE Electronics Ltd., Montreal (Quebec).
THE FIBER-OPTIC HELMET-MOUNTED DISPLAY
B. Welch and M. Shenker *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 345-361 (For primary document see N85-17962 09-01)
(AD-P004330) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17985# CAE Electronics Ltd., Montreal (Quebec).
BINOCULAR OVERLAP IN A FIBER OPTIC HELMET MOUNTED DISPLAY
R. Kruk and T. M. Longridge *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 363-378 (For primary document see N85-17962 09-01)
(AD-P004331) Avail: NTIS HC A22/MF A01 CSCL 01/2

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-18056# National Aerospace Lab., Tokyo (Japan).
RESEARCH AND DEVELOPMENT FOR SEMI-SPHERICAL INFLOW CONTROL DEVICE
Hiroshi Kobayashi, Tadao Torisaki, Mitsuo Morita, Susumu Nakayama, Akira Yoshida, Makoto Sasaki, Sizuo Sekine, Shigemi Shindo, and Hiroharu Takagi Sep. 1984 20 p refs In JAPANESE; ENGLISH summary
(NAL-TR-833; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Difference of aero-engine fan noise levels between static and flight engine testing is due to inflow distortion and atmospheric turbulence during static engine testing. Therefore, a semi-spherical inflow control device (ICD) was developed in order to simulate flight fan noise in static tests by the reduction of inflow distortion and turbulence. Based on fundamental data acquired for design and construction of an ICD, a 4 m dia. semi-spherical ICD for an actual turbofan engine was designed and built. Tests confirmed that it was a good flight fan noise simulator. Author

N85-18057*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL AND ANALYTICAL STUDY OF CERAMIC-COATED TURBINE-TIP SHROUD SEALS FOR SMALL TURBINE ENGINES
T. J. Biesiadny, G. E. McDonald, R. C. Hendricks, J. K. Little, R. A. Robinson (AVSCOM Research and Technology Labs, Cleveland, Ohio), G. A. Klann (AVSCOM Research and Technology Labs, Cleveland, Ohio), and Eliot Lassow (Howmet Turbine Components Corp., Whitehall, Mich.) Jan. 1985 32 p refs
(NASA-TM-86881; E-2343; NAS 1.15:86881; USAAVSCOM-TR-C-19) Avail: NTIS HC A03/MF A01 CSCL 21E

The results of an experimental and analytical evaluation of ceramic turbine tip shrouds within a small turbine engine operating environment are presented. The ceramic shrouds were subjected to 1001 cycles between idle and high power and steady-state conditions for a total of 57.8 engine hr. Posttest engine inspection revealed mud-flat surface cracking, which was attributed to microcracking under tension with crack penetration to the ceramic and bond coat interface. Sections and micrographs tend to corroborate the thesis. The engine test data provided input to a thermomechanical analysis to predict temperature and stress profiles throughout the ceramic gas-path seal. The analysis predicts cyclic thermal stresses large enough to cause the seal to fail. These stresses are, however, mitigated by inelastic behavior of the shroud materials and by the microfracturing that tensile stresses produce. Microfracturing enhances shroud longevity during early life but provides the failure mechanism during life but provides the failure mechanism during extended life when coupled with the time dependent inelastic materials effects. Author

N85-18058*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Engineering.
STUDY OF CONTROLLED DIFFUSION STATOR BLADING Final Report
R. F. Behlke, J. D. Brooky, and E. Canal Mar. 1983 134 p refs (Contract NAS3-22008)
(NASA-CR-167995; NAS 1.26:167995; PWA-5698-77) Avail: NTIS HC A07/MF A01 CSCL 21E

Tests were conducted on a high tip speed, highly loaded front compressor stage having low aspect ratio rotor and stator airfoils. The stator airfoils were designed by the controlled diffusion procedure recently developed by P&WA for designing transonic cascade airfoils. The rotor blades consisted of multiple-circular-arc airfoil sections. The stage had a tip speed of 442 m/sec (1450 ft/sec), a hub/tip ratio of 0.597, a rotor aspect ratio of 1.3, and a stator aspect ratio of 1.45. At design speed the rotor-stator stage achieved an adiabatic efficiency of 89.1% at design flow and pressure ratio. Surge margin was 14%. The stage efficiency exceeded the design goal by 0.6 percentage points. The rotor efficiency was 92.4%, exceeding design by 0.3 percentage points. The controlled diffusion stator demonstrated a lower minimum loss over the multiple-circular-arc stator from the root to 70 percent span. A surge diffusion factor of 0.72 was reached at both the rotor tip and the stator root. The NAS3-22008 program demonstrated its intent: high efficiency and loading levels with low aspect ratio blades and the controlled diffusion stator in the unfavorable front stage environment. Author

N85-18059# Naval Postgraduate School, Monterey, Calif.
AN ANALYTIC MODEL OF GAS TURBINE ENGINE INSTALLATIONS M.S. Thesis
S. M. Ezzell Sep. 1984 225 p
(AD-A148708) Avail: NTIS HC A10/MF A01 CSCL 21/5

An interactive computer simulation of marine gas turbine installations including intake and exhaust ducting for the engine and module cooling has been developed. A one-dimensional analysis was used in determining the pressure losses of the ducting. The pressure losses along with the ambient conditions and desired power setting define a unique operating point for the system. The computer model predicts operating parameters for this point by an inerative matching technique. GRA

N85-18060# Southwest Research Inst., San Antonio, Tex.
EXPLORATORY DEVELOPMENT OF ADVANCED SURFACE FLAW DETECTION METHODS Final Report, 1 Jun. 1982 -

31 Oct. 1984
Robert E. Beissner, Gary L. Burkhardt, and Felix N. Kusenberger
Sep. 1984 139 p
(Contract F33615-82-C-5020)
(AD-A148757; SWRI-15-7106; AFWAL-TR-84-4121) Avail: NTIS HC A07/MF A01 CSCL 21/5

Development of the electric current perturbation (ECP) method for application to surface flaw detection in the retirement-for-cause (RFC) inspection system is described. Physical constraints imposed by material properties and complex geometrical features of F100 engine parts are discussed as background for the selection and preparation of specimens for experimental optimization of ECP probe design. Experimental flaw detection data are presented for simple laboratory specimens, specimens designed to simulate complex geometry features of concern in F100 engine inspection, and finally, for actual engine parts. Results demonstrate that the detection of flaws even smaller than 0.010 in. long by 0.005 in. deep is possible in blade slots. Also, from experimental data obtained in blade slot scans, preliminary estimates of the probability of detection as a function of flaw size are provided. Based on data reported here, it is concluded that ECP method has been demonstrated with the breadboard system to have the inherent sensitivity and repeatability to meet RFC requirements regarding flaw detection capability and system compatibility, and is now ready for more extensive evaluation in an actual inspection environment. GRA

N85-18061# Rolls-Royce Ltd., Derby (England).
CURRENT STATUS OF TRAILING EDGE LOSS CALCULATION FOR A TURBINE BLADE
Hans Bryner 15 Nov. 1984 27 p refs Transl. into ENGLISH from Ver. Deut. Ing. Ber. (Baden, Switzerland), no. 264, 1976 p 203-214
(PNR-90244; Trans-12432/TLT-00947) Avail: NTIS HC A03/MF A01

Methods for calculating trailing edge loss of a turbine blade are reviewed. Theoretical results reproduce well for certain cascade and turbine tests for smaller values of relative trailing edge thickness (delta 0). For thicker trailing edges the assumptions as met in the theoretical derivation of the losses are less and less well fulfilled, so that an increasing deviation of the actual trailing edge losses from those calculated appears plausible. Since the base pressure region widens with increasing delta 0 and exerts an increasingly strong influence on the exit flow, base pressure must be included in the theoretical analysis for thick trailing edges in order to approximate well test results. Author (ESA)

N85-18062# Rolls-Royce Ltd., Derby (England).
DEVELOPMENT OF HIGH TEMPERATURE CERAMIC PARTS FOR VEHICULAR GAS TURBINES
Werner Huether and Wolfgang Krueger 19 Nov. 1984 58 p refs Transl. into ENGLISH from Bundesmin. fuer Forsch. u. Technol., Bonn Rept. BMFT-FB-T-84-006, Jan. 1984 70 p Original language doc. announced as N84-24812
(PNR-90245; Trans-17654/TLT-00948; BMFT-FB-T-84-006) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

Ceramic components for a truck gas turbine were designed and tested. A combustion chamber variant of SiC + Si survives a running time of 22.3 hr without damage under pressure conditions with cyclic load. The inlet cone of fabricated design remains free of cracks in all test runs. Stator varieties were tested under atmospheric conditions at 1650 K. No damage occurs in stator segments. Integral stators shrouds crack. A metallic disk with set-in ceramic blades survives 5000 load cycles from 0 to 465 m/sec circumferential speed with reference to the blade central cross section without damage in the cold spin test. Blades of HPSN and RBSN were tested in the hot spin test (maximum gas temperature 1470 K). Ultrasonic countersinking and shape-grinding ceramic processing methods were developed. Author (ESA)

N85-18207# Joint Publications Research Service, Arlington, Va.
ON SELECTING BYPASS MIXERS FOR TURBOFAN ENGINES Abstract Only
B. D. Fishbeyn *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 18 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 94-96 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18208# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SETTING ANGLE OF JET COOLING NOZZLES ON TEMPERATURE AND STRESS STATE OF A TURBINE WHEEL Abstract Only
V. V. Zhuykov, Ye. I. Lashuk, and Yu. I. Yunkerov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 18-19 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 77-80 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18210# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF AERODYNAMIC SHIELDING OF TURBOJET ENGINE AIR INTAKE AGAINST EXHAUST GASES Abstract Only
M. M. Vysokogorets, M. Sh. Gilyazov, V. A. Kosterin, and M. G. Khabibullin *In its* USSR Rept. Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 20 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 60-63 Original language document was announced in IAA as A84-25567 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18219# Joint Publications Research Service, Arlington, Va.
ON LIMITS OF APPLICABILITY OF LINEAR MODELS TO DYNAMICS OF GAS CHANNELS IN AIRCRAFT ENGINES Abstract Only
A. V. Baykov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 30-31 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 101-104 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-18063 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ACTIVE CONTROL OF FORWARD SWEPT WINGS WITH DIVERGENCE AND FLUTTER AEROELASTIC INSTABILITIES Ph.D. Thesis
Kenneth Edward Griffin 1984 150 p
Avail: Univ. Microfilms Order No. DA8425340

Simple active control laws to suppress aeroelastic flutter and divergence on forward-swept advanced composite wings are studied. Two selected wing designs are used as examples where leading-and trailing-edge flaps are used as control devices. These flaps are actuated using simple feedback signals from acceleration, velocity, and displacement sensors. Root locus plots of the characteristic roots from the transformed equations of motion are used to determine the aeroelastic stability of each feedback controlled configuration. The transformed aerodynamic forces are expressed as Pade Approximants obtained from a least-squares fitting scheme of sinusoidal generalized aerodynamic forces. With a leading-edge flap and elastic displacement sensing an increase of divergence speed of approximately 25% is demonstrated. A 30% increase in flutter was achieved with a trailing-edge flap and acceleration sensing. If high flutter speeds are provided for the uncompensated wing before active control is applied, a better wing design may be available for active control divergence.
Dissert. Abstr.

N85-18064 Kansas Univ., Lawrence.
THEORY OF WING ROCK Ph.D. Thesis
Chung-Hao Hsu 1984 112 p
Avail: Univ. Microfilms Order No. DA8424298

A theory is developed for predicting wing-rock characteristics. From available data, it can be concluded that wing rock is triggered by flow asymmetries, developed by negative or weakly positive roll damping, and sustained by nonlinear aerodynamic roll damping. A new nonlinear aerodynamic model that includes all essential aerodynamic nonlinearities is developed. The Beecham-Titchener method is applied to obtain approximate analytic solutions for the amplitude and frequency of the limit cycle based on three-degree-of-freedom equations of motion. An iterative scheme is developed to calculate the average aerodynamic derivatives and dynamic characteristics at limit cycle conditions. Good agreement between theoretical and experimental results is obtained. Dissert. Abstr.

N85-17965# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
ALTITUDE CONTROL USING ACTION-DEMANDING INTERACTIVE DISPLAYS: TOWARD AN ACTIVE PSYCHOPHYSICS
R. Warren and G. R. McMillan *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 37-51 (For primary document see N85-17962 09-01)
(AD-P004311) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17979# General Electric Co., Daytona Beach, Fla. Simulation and Control Systems Dept.
CONTROL SYSTEMS ANALYSIS PROGRAM: A TOOL FOR ANALYSIS OF THE GE-VSCDP (GENERAL ELECTRIC-VISUAL SYSTEM COMPONENT DISPLAY PROGRAM) IMAGE DISPLAY SYSTEM
C. Chi and E. Pollak *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 267-278 (For primary document see N85-17962 09-01)
(AD-P004325) Avail: NTIS HC A22/MF A01 CSCL 01/2

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-18065# National Aerospace Lab., Tokyo (Japan).
HIGH PRESSURE COMBUSTION TEST FACILITY FOR GAS TURBINE RESEARCH
T. Tamaru, K. Shimodaira, S. Horiuchi, T. Saito, and S. Hayashi Mar. 1984 28 p refs In JAPANESE; ENGLISH summary
(NAL-TR-801; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A new high pressure combustion test facility was constructed in the National Aerospace Laboratory, Tokyo, to assist the national project for developing a high efficiency combined cycle gas turbine. It enables continuous combustion tests by an air mass flow of 4 kg/s at a pressure of 5./53 MPa and a temperature of 736 K in the design condition. Two kinds of fuel, i.e., natural gas and kerosene, are available for tests at a maximum supply pressure of 10 MPa. Details of the planning of the facility and the structure are described. In designing the building, special care was taken to prevent anticipated noise pollution of the surrounding area. Test runs, made early in the spring of 1983, proved successful. Author

N85-18066# National Aerospace Lab., Tokyo (Japan).
FLOW QUALITY OF NAL 2-DIMENSIONAL TRANSONIC WIND TUNNEL. PART 2: EXTENSIVE AND SYSTEMATIC PRESSURE FLUCTUATIONS STUDY IN THE SETTLING CHAMBER, TEST SECTION AND SECOND THROAT OF THE NAL 2-D TRANSONIC WIND TUNNEL
Seizo Sakakibara, Hitoshi Miwa, Yasuo Oguni, Mamoru Sato, and Hiroshi Kanda Sep. 1984 32 p refs In JAPANESE; ENGLISH summary
(NAL-TR-836-Pt2; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

To obtain a better understanding of the characteristic of the facility disturbances and identification of their sources, detailed pressure fluctuation measurements were made in the settling chamber, the test section and the second throat of the NAL two dimensional transonic wind tunnel. In order to identify the test section wall slot effects, the following measurements were made; keeping the side wall slot (for wake survey probe trav..) open measurements were made with the transonic slots (top and bottom walls) both open and closed; then, conversely, keeping the transonic slots open measurements were made with the side wall slot open and closed. The pressure fluctuations of the flow at these locations in the wind tunnel were measured by means of wall or sting mounted ultra miniature pressure sensors. The data, which represented a frequency range from about 15 Hz to 25 kHz, have been analyzed in the form of broadband sound pressure levels, root mean square fluctuations of pressure coefficient and spectra of pressure fluctuations. There is a brief discussion of each item. B.W.

N85-18067*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE ALTITUDE WIND TUNNEL (AWT): A UNIQUE FACILITY FOR PROPULSION SYSTEM AND ADVERSE WEATHER TESTING
Roger Chamberlin 1985 21 p refs Presented at the 23rd Aerospace Sci. Meeting, Reno, Nevada, 14-17 Jan. 1985; sponsored by AIAA
(NASA-TM-86921; E-2415; NAS 1.15:86921; AIAA-85-0314) Avail: NTIS HC A02/MF A01 CSCL 14B

A need has arisen for a new wind tunnel facility with unique capabilities for testing propulsion systems and for conducting research in adverse weather conditions. New propulsion system concepts, new aircraft configurations with an unprecedented degree of propulsion system/aircraft integration, and requirements for aircraft operation in adverse weather dictate the need for a new test facility. Required capabilities include simulation of both altitude pressure and temperature, large size, full subsonic speed range, propulsion system operation, and weather simulation (i.e., icing, heavy rain). A cost effective rehabilitation of the NASA Lewis Research Center's Altitude Wind Tunnel (AWT) will provide a facility with all these capabilities. Author

N85-18068*# Vigyan Research Associates, Inc., Hampton, Va.
THE GENERATION OF ROLLING MOMENTS WITH THE SUPERCONDUCTING SOLENOID MODEL
Michael J. Goodyear Jan. 1985 24 p refs
(Contract NAS1-17919)
(NASA-CR-172520; NAS 1.26:172520) Avail: NTIS HC A02/MF A01 CSCL 14B

The superconducting solenoid model is a pilot model core for levitation in a wind tunnel magnetic suspension system. This type of core would replace the ferromagnetic core typically installed in the model fuselage. For suspension purposes, the solenoid is operated upon by a set of electromagnets surrounding the wind tunnel which are to support and restrain the model at required positions and orientations under the influence of powerful aerodynamic disturbances. The subject of providing sources of magnets rolling moment for use when spanwise magnets, which can be used for winged models, are not available is covered. Several methods have emerged for generating a rolling moment based on the use of additional superconducting loops or magnetic poles positioned around or within the solenoid. Predictions of the moment capacities of superconducting loops in models sized for a large wind tunnel are presented. An existing prototype superconducting model proved a suitable vehicle for demonstrating and calibrating, at a smaller scale, some of the other roll elements based on magnetic pole devices. Calibration data are included. Author

N85-18069*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INITIAL INVESTIGATION OF CRYOGENIC WIND TUNNEL MODEL FILLER MATERIALS
H. F. Rush and G. C. Firth Jan. 1985 23 p refs
(NASA-TM-86363; NAS 1.15:86363) Avail: NTIS HC A02/MF A01 CSCL 14B

Various filler materials are being investigated for applicability to cryogenic wind tunnel models. The filler materials will be used to fill surface grooves, holes and flaws. The severe test environment of cryogenic models precludes usage of filler materials used on conventional wind tunnel models. Coefficients of thermal expansion, finishing characteristics, adhesion and stability of several candidate filler materials were examined. Promising filler materials are identified. Author

N85-18070# Army Construction Engineering Research Lab., Champaign, Ill.
PROTOTYPE CONCEPT DESIGN FOR US ARMY TYPE 3A AIR TRAFFIC CONTROL TOWER (ATCT) Final Report
T. R. Napier and M. E. Lierman Oct. 1984 143 p
(AD-A148840; CERL-TR-P-85/02) Avail: NTIS HC A07/MF A01 CSCL 01/5

In April 1983, the U.S. Army Air Traffic Control Activity requested the U.S. Army Construction Engineering Research Laboratory to develop a prototype concept design for a Type 3a Air Traffic Control Tower (ATCT). The design was to be for a prefabricated, modular, and transportable building system that could be fabricated, placed in storage, deployed, and erected in a variety of configurations. This report documents the development of functional requirements for the Type 3a ATCT, as well as considerations for its prefabrication, transportation, and erection. The report also presents the prototype concept design for the Type 3a ATCT. The design includes architectural drawings as well as descriptions of the building system's construction approach and materials. Information needed to acquire these facilities is presented, including recommendations for a One-Step or Two-Step procurement approach and guidance to Corps personnel for executing this approach. Finally, the report provides an outline for bid documentation, including an outline specification for the building system. GRA

N85-18071# European Space Agency, Paris (France).
THE S2MA WIND TUNNEL AT THE MODANE-AVRIEUX AERODYNAMIC TEST CENTER
Jean Laverre and Francois Charpin Sep. 1984 75 p refs Transl. into ENGLISH of "La Soufflerie S2MA du Centre d'Essais Aerodyn. de Modane-Avrieux" Rept. ONERA-NT-1983-5 ONERA, Paris, 1983 Original Language document announced as N84-25735
(ESA-TT-862; ONERA-NT-1983-5) Avail: NTIS HC A04/MF A01

A continuous pressurized S2MA wind tunnel with a 1.75 x 1.77 sq m transonic section (Mach 0.1 to 1.3) and a 1.75 x 1.935 sq m supersonic section (Mach 1.5 to 3.1) is presented. Supports used are described, and tests which illustrate the possibilities of the facility are listed. Instrumentation as well as data acquisition and processing are summarized. Schematics are included. Author (ESA)

N85-17963# Air Training Command, Nellis AFB, Nev.
USING A LIMITED FIELD OF VIEW SIMULATOR TO INSTRUCT HIGH SPEED, LOW ALTITUDE FLYING SKILLS
M. Miller *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 7-20 (For primary document see N85-17962 09-01)
(AD-P004309) Avail: NTIS HC A22/MF A01 CSCL 05/9

N85-17964# Dayton Univ., Ohio. Research Inst.
VISUAL PERCEPTUAL ASPECTS OF LOW LEVEL HIGH SPEED FLIGHT AND FLIGHT SIMULATION
R. S. Kellogg and M. Miller *In* AF Human Resouces Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 21-36 (For primary document see N85-17962 09-01)
(AD-P004310) Avail: NTIS HC A22/MF A01 CSCL 05/9

N85-17966# LTV Aerospace Corp., Dallas, Tex.
LOW ALTITUDE HIGH SPEED FLIGHT SIMULATION USING VIDEO DISC TECHNOLOGY
V. Devarajan, J. T. Hooks, Jr., and D. C. McGuire *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 53-65 (For primary document see N85-17962 09-01)
(AD-P004312) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17967# Tactical Airlift Training Group (34th), Little Rock AFB, Ark.
SIMULATING SPEED AND HEIGHT CUES IN THE C-130 WEAPON SYSTEM TRAINER
M. J. Sieverding *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 69-77 (For primary document see N85-17962 09-01)
(AD-P004313) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17968# Grumman Aerospace Corp., Bethpage, N.Y.
PRODUCING HIGH SCENE CONTENT WITH PERSPECTIVE VALIDITY
G. Y. Gardner and R. S. Rulon *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 79-94 (For primary document see N85-17962 09-01)
(AD-P004314) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17974# Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Brevannes (France).
SODERN VISUALIZATION SYSTEM (SVS) FOR FLIGHT SIMULATION
F. X. Doittau, J. R. Huriet, and M. Tissot *In* AF Human Resouces Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 193-203 (For primary document see N85-17962 09-01)
(AD-P004320) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17975# Essex Corp., Alexandria, Va.
AN OVERVIEW OF THE RESEARCH PROGRAM AT THE VISUAL TECHNOLOGY RESEARCH SIMULATOR
G. Lintern, D. C. Wightman, and D. P. Westra *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 205-221 (For primary document see N85-17962 09-01)
(AD-P004321) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17978# General Electric Co., Daytona Beach, Fla.
DESIGN CONSIDERATIONS FOR AN EYE TRACKED AOI (AREA OF INTEREST) DISPLAY SYSTEM
F. B. Neves *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 255-266 (For primary document see N85-17962 09-01)
(AD-P004324) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17980# Singer Co., Silver Spring, Md. Link Simulation Systems Div.
PROGRESS REPORT ON AN EYE-SLAVED AREA-OF-INTEREST VISUAL DISPLAY
H. M. Tong and R. A. Fisher *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 279-294 (For primary document see N85-17962 09-01)
(AD-P004326) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17981# Rediffusion Simulation, Inc., Arlington, Tex.
AIR COMBAT VISUAL SIMULATION USING A HEAD SLAVED PROJECTOR
P. M. Murray, G. J. Olive, M. E. Roberts, and O. Wynn *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 295-311 (For primary document see N85-17962 09-01)
(AD-P004327) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17982# KFO Associates, Inc., Wyckoff, N.J.
A SECOND GENERATION WAVIDS (WIDE ANGLE VIRTUAL IMAGE DISPLAY SYSTEM)
A. Cox and W. V. Dykes *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 315-329 (For primary document see N85-17962 09-01)

(Contract N61339-83-C-0096)
(AD-P004328) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17986# Boeing Military Airplane Development, Wichita, Kans.
BAFFLED EYE AND CONFOUNDED BRAIN OR USING VISUAL ILLUSIONS TO TRAIN BLIND PILOTS
R. E. Clapp *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 391-404 (For primary document see N85-17962 09-74)
(AD-P004332) Avail: NTIS HC A22/MF A01 CSCL 09/2

N85-17991# Singer Co., Lancing (England).
MILITARY APPLICATIONS OF THE SINGER LINK-MILES IMAGE VISUAL SYSTEM
D. H. Geere and T. Crampin *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 455-474 (For primary document see N85-17962 09-01)
(AD-P004337) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17992# General Electric Co., Daytona Beach, Fla.
AVTS (ADVANCED VISUAL TECHNOLOGY SYSTEM): A HIGH FIDELITY VISUAL SIMULATOR
R. L. Ferguson *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 455-474 (For primary document see N85-17962 09-01)
(AD-P004338) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-18038# Joint Publications Research Service, Arlington, Va.
AIRPORT GROUND EQUIPMENT UNDER DEVELOPMENT AT RIGA
I. Afanasyev *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 29-30 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 27 Nov. 1984 p 2 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

N85-18039# Joint Publications Research Service, Arlington, Va.
IMPROVEMENTS IN KAZAN AIRPORT EQUIPMENT, FACILITIES
Y. Tsipin *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 34-36 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 29 Nov. 1984 p 3 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

N85-18040# Joint Publications Research Service, Arlington, Va.
IMPROVEMENTS UNDER WAY AT GORKIY AIRPORT
V. Deberdeyev *In its* USSR Rept.: Transportation (JPRS-UTR-85-003) 12 Feb. 1985 p 37-39 Transl. into ENGLISH from Vozdushnyy Transport (USSR), 4 Dec. 1984 p 1 (For primary document see N85-18032 09-03)
Avail: NTIS HC A06/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-18072*# Eagle Engineering, Inc., Houston, Tex.
IMPACT OF LUNAR AND PLANETARY MISSIONS ON THE SPACE STATION: PRELIMINARY STS LOGISTICS REPORT
21 Sep. 1984 45 p
(Contract NAS9-17176)
(NASA-CR-171837; NAS 1.26:171837; Rept-84-85B) Avail: NTIS HC A03/MF A01 CSCL 22A

Space station requirements for lunar and planetary missions are discussed. Specific reference is made to projected Ceres and Kopff missions; Titan probes; Saturn and Mercury orbiters; and a Mars sample return mission. Such requirements as base design; station function; program definition; mission scenarios; uncertainties impact; launch manifest and mission schedule; and shuttle loads are considered. It is concluded that: (1) the impact of the planetary missions on the space station is not large when compared to the lunar base; (2) a quarantine module may be desirable for sample returns; (3) the Ceres and Kopff missions require the ability to stack and checkout two-stage OTVs; and (4) two to seven manweeks of on-orbit work are required of the station crew to launch a mission and, with the exception of the quarantine module, dedicated crew will not be required. A.S.B.

N85-18073# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
AUTOMATIC MONOELLIPSOIDAL MIRROR FURNACE FACILITY (AMMFF), VOLUME 1 Final Report
J. Stapelmann and E. Turci Paris ESA 1984 33 p Prepared in cooperation with Aeritalia, S.p.A., Torino
(Contract ESA-5239/83/F-FC(SC))
(AMF-RP.100-DS-015-Vol-1; ESA-CR(P)-1945-Vol-1) Avail: NTIS HC A03/MF A01

The concept synthesis and preliminary specification of the Automatic Monoellipsoidal Mirror furnace Facility (AMF) for single crystal growth are presented. The sample storage and exchange mechanism is described. Standardized ampoule design; achievable sample temperature using a 300 W halogen lamp and graphite as sample material; vibrational behavior of lamp and sample; lamp life time; and TiN shell coating were studied. Author (ESA)

N85-18074# Deutsche Forschungsgemeinschaft, Bad Godesberg (West Germany).
SPACE RESEARCH IN THE FEDERAL REPUBLIC OF GERMANY Annual Report, 1982-1983
1984 92 p refs Presented at 25th COSPAR Plenary Meeting, Graz, 25 Jun. - 7 Jul. 1984
Avail: NTIS HC A05/MF A01

West German space research concerning Earth observation is summarized. Topics presented are: aeronomy; ionospheric physics; magnetosphere; solar radiation and solar wind; solar system (planets); stellar astronomy; cosmic rays; life sciences; and material sciences. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N85-18075# National Aerospace Lab., Tokyo (Japan).
THEORY OF THE ORBITAL MOTION OF AN ARTIFICIAL EARTH SATELLITE
Sumio Takeuchi May 1985 55 p refs In JAPANESE; ENGLISH summary
(NAL-TR-807; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

Considering dominant perturbative influences and coupling effects among them, a unified theory of the orbital motion of an artificial Earth satellite is developed. The theory includes very realistic and complex perturbation models and provides analytically a relatively accurate visualization of the effects of the various perturbations. As the dominating perturbative influences the Earth's gravitational perturbations, the lunar solar perturbations, the solar radiation pressure perturbation, the atmospheric drag perturbation, and small perturbing forces provided by the thrusts of propulsion systems are taken into account. Disturbing functions, perturbing accelerations, and angular elements referred to the adopted system are expressed analytically. On referring to the expressions of disturbing functions, perturbing accelerations, and angular elements referred to the adopted system, the time rates of change of the orbital elements are derived by use of the equations of motion. The resulting equations are integrated by the method of linear perturbations to obtain the first order perturbations. With the use of the variations in the orbital elements the motion of the artificial Earth satellite is determined. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N85-18076*# National Aeronautics and Space Administration, Washington, D. C.
25TH ANNIVERSARY OF THE GAGARIN COSMONAUT TRAINING CENTER
I. Goreglyad and G. Shonin Jan. 1985 12 p Transl. into ENGLISH from Aviatsiya Kosmonautika (USSR), no. 12, 1984 p 40-42 Transl. by The Corporate Word, Pittsburgh
(Contract NASw-4006)
(NASA-TM-77644; NAS 1.15:77644) Avail: NTIS HC A02/MF A01 CSCL 14B

Interviews with retired Major General of Aviation L. Goreglyad and pilot-cosmonaut with the 25th anniversary of the establishment of the Gagarin Cosmonaut Training Center. Major-General Goreglyad, one of the Center's founders, tells of its development. Major General Shonin, one of the first cosmonauts to train there, tells of the tests and procedures leading to his acceptance as a trainee. Author

N85-18077# European Space Agency, Paris (France).
MAKING SURE: A BRIEF OUTLINE AND HISTORY OF ESA'S TEST AND CHECKOUT SERVICES
Norman Longdon, ed. and Duc Guyenne, ed. 1984 17 p Original contains color illustrations
(ESA-BR-22; ISSN-0250-1589) Avail: NTIS HC A02/MF A01

The development of ESA's environmental testing and satellite checkout facilities is described. ESA's purpose is to provide for and promote cooperation amongst European States on space research and technology and their nonmilitary applications. One of the most sophisticated services is the satellite checkout infrastructure. The wide range of tests are carried out at three different test facilities. Author (ESA)

N85-18379# Defense Nuclear Agency, Washington, D.C.
INVITED PAPERS: DNA ICBM TECHNICAL R AND D PROGRAM
Maxim I. Kovel *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 23-41 refs (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 14/2

N85-18381# Air Force Space Technology Center, Kirtland AFB, N. Mex.
AIR FORCE SPACE TECHNOLOGY CENTER SPACE TECHNOLOGY: EMPHASIS 84
Frank J. Redd *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 55-57 refs (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 14/2

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-18078# National Aerospace Lab., Tokyo (Japan).
VIBRATION ANALYSIS OF A MULTIPURPOSE PLATFORM
Taketoshi Hanawa, Yoshiaki Ohkami, Eiichi Nakai, and Tsuguo Tadakawa Apr. 1984 42 p refs In JAPANESE; ENGLISH summary
(NAL-TR-803; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Some results are presented of the vibration analysis for simplified models of a multipurpose geostationary platform. For the detailed analysis, the finite element method is widely used, but in a preliminary analysis the method described here is also useful since it is computationally tractable and easy to handle although there are constraints on the configuration complexity. A mission model is described for the proposed platform containing six missions of communication and broadcasting. Launch sequences and deployments of the platform, and mass and inertia properties of the constitutent modules are briefly explained. The analysis procedure is presented together with the simplifing assumptions and the main results. The analysis are performed not only for the final platform of cross type and T-letter configuration but also for the interim stages of construction. The results are shown in figures with numerical tables. Author

N85-18216# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL SATELLITE SYSTEM FOR DETERMINING COORDINATES OF MARITIME DISTRESS Abstract Only
I. S. Bronitskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 25 Transl. into ENGLISH from Sudostr. (Leningrad), no. 2, Feb. 1984 p 40-42 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18380# Army Missile Command, Redstone Arsenal, Ala.
SOME DYNAMICAL ASPECTS OF ARMY MISSILE SYSTEMS
James J. Richardson *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 43-53 (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 16/4

N85-18900*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SATELLITE DESCRIPTION
F. C. Gillett, P. E. Clegg, G. Neugebauer, D. Langford, A. Pouw, W. Irace, and J. Houck *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 25 p refs (For primary document see N85-18898 09-89)
Avail: NTIS HC E14/MF A01 CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-18079*# National Academy of Sciences - National Research Council, Washington, D. C. Ad Hoc Committee on Space Station Engineering and Technology Development.

SPACE STATION ENGINEERING AND TECHNOLOGY DEVELOPMENT

1985 86 p

(Contract NASw-3455)

(NASA-CR-174383; NAS 1.26:174383) Avail: NTIS HC A05/MF A01 CSCL 22B

Historical background, costs, organizational assignments, technology development, user requirements, mission evolution, systems analyses and design, systems engineering and integration, contracting, and policies of the space station are discussed. B.G.

N85-18080*# TRW, Inc., Sunnyvale, Calif.

STUDY OF APPLICATION OF SPACE TELESCOPE SCIENCE OPERATIONS SOFTWARE FOR SIRTF USE

F. Dignam, E. Stetson, and W. Allendoerfer Feb. 1985 81 p refs

(Contract NAS2-11938)

(NASA-CR-177337; NAS 1.26:177337) Avail: NTIS HC A05/MF A01 CSCL 03A

The design and development of the Space Telescope Science Operations Ground System (ST SOGS) was evaluated to compile a history of lessons learned that would benefit NASA's Space Infrared Telescope Facility (SIRTF). Forty-nine specific recommendations resulted and were categorized as follows: (1) requirements: a discussion of the content, timeliness and proper allocation of the system and segment requirements and the resulting impact on SOGS development; (2) science instruments: a consideration of the impact of the Science Instrument design and data streams on SOGS software; and (3) contract phasing: an analysis of the impact of beginning the various ST program segments at different times. Approximately half of the software design and source code might be useable for SIRTF. Transportability of this software requires, at minimum, a compatible DEC VAX-based architecture and VMS operating system, system support software similar to that developed for SOGS, and continued evolution of the SIRTF operations concept and requirements such that they remain compatible with ST SOGS operation. B.G.

N85-18081# AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien Raumfahrt.

MANNED SPACE STATION SOLAR ARRAY STUDY Final Report

Paris ESA 1984 214 p refs

(Contract ESA-5304/82/F-FC(SC))

(ESA-CR(P)-1941) Avail: NTIS HC A10/MF A01

A reference concept for the Columbus Manned Space Station Solar Array (MSS-SA) >100 kW system was developed. The MSS-SA is a nondedicated, stand alone system. High priority should be given to clarifying MSS-SA interface requirements/conditions. The MSS-SA must meet a power continuum from baseline sizes in the 100 kW regime (40 to 50 kW user load) up to more than twice as much. A conventional approach (SOLA-type), improved such that it can meet the above power continuum is likely. Given possible enhanced power continua by future spread MSS scenarios, a clear decision between SOLA-type and shuttle-accommodated HC-HP SA (Cassegrain type) is too early. Industries in Europe are competent for developing large and technologically ambitious SA up to the required power regimes. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-18082# National Aerospace Lab., Tokyo (Japan).

A STUDY ON A MEDIUM-SIZED ROCKET WITH BURNOUT FRAME

Yojiro Mutoh Jul. 1984 64 p refs In JAPANESE; ENGLISH summary

(NAL-TR-821; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

A medium-sized single stage solid-propellant meteorological rocket is described which ejects a 4 Kg radio sonde with a parachute at an altitude of 60 Km to gather wind speed, direction, and temperature data on the upper stratosphere and mesosphere. After the mission, the rocket motor, including fins and nose cone, burn to ash. Therefore there is no danger that any of the system will fall to the earth and cause damage. The rocket is 140 mm in diameter, 3000 mm long and weighs 70 Kg when provided with a standard sounding sonde. However, the exact length and weight vary with the type of payload, whether metal chaff, silver-iodide, etc. There are two basic configurations of this rocket system, one for high altitude meteorology, the other for scattering AgI in weather modification projects. The latter is also used for ejecting chaff in radar-location experiments. Author

N85-18083# National Aerospace Lab., Tokyo (Japan).

A STUDY OF AIR BREATHING ROCKETS. PART 4: DIRECT FUEL INJECTION INTO A SECONDARY COMBUSTOR

Atsuo Murakami, Tomoyuki Komuro, Kenji Kudou, Goro Masuya, and Nobuo Chinzei Sep. 1984 15 p refs In JAPANESE; ENGLISH summary

(NAL-TR-832; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

In order to reduce secondary combustor length of an air breathing rocket, an experimental study of the effect of direct fuel injection into the secondary combustor was conducted. Fuel was injected from eighteen circular ports of two millimeters diameter on the combustor wall. Injection direction was normal to the wall. Gas composition and pressure were measured on the wall and in the exit plane of the secondary combustor. The results were compared with those obtained in experiments without direct fuel injection, where all the fuel for secondary combustion was supplied only by the exhaust of a primary rocket. Significant improvement in both mixing and secondary combustion performances was achieved by injection. Turbulence in the stream produced by fuel injection enhanced mixing of the air stream and the rocket exhaust. Fuel injection also made fuel distribution uniform in a cross section of the secondary combustor. The degree of improvement was proportional to the injected fuel mass flow rate while the rate was low. As the mass flow rate of injectant became higher, the improvement was saturated. Author

N85-18084*# Creare, Inc., Hanover, N.H.

ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF RUBBING INTERACTION IN LABYRINTH SEALS FOR A LIQUID HYDROGEN FUEL PUMP Final Report

Francis X. Dolan, Francis E. Kennedy, and Erland M. Schulson Aug. 1984 200 p

(Contract NAS3-23276)
(NASA-CR-174657; NAS 1.26:174657; Creare-TN-371) Avail: NTIS HC A09/MF A01 CSCL 21H

Cracking of the titanium knife edges on the labyrinth seals of the liquid hydrogen fuel pump in the Space Shuttle main engine is considered. Finite element analysis of the thermal response of the knife edge in sliding contact with the wear ring surface shows that interfacial temperatures can be quite high and they are significantly influenced by the thermal conductivity of the surfaces in rubbing contact. Thermal shock experiments on a test specimen similar to the knife edge geometry demonstrate that cracking of the titanium alloy is possible in a situation involving repeated thermal cycles over a wide temperature range, as might be realized during a rub in the liquid hydrogen fuel pump. High-speed rub interaction tests were conducted using a representative knife edge and seal geometry over a broad range of interaction rates and alternate materials were experimentally evaluated. Plasma-sprayed aluminum-graphite was found to be significantly better than presently used aluminum alloy seals from the standpoint of rub performance. Ion nitriding the titanium alloy knife-edges also improved rub performance compared to the untreated baseline.
A.B.H.

N85-18085# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C.
PROCEEDINGS OF THE AFOSR/AFRPL ROCKET PROPULSION RESEARCH MEETING: ABSTRACTS AND AGENDA Interim Report, Mar. 1983 - Feb. 1984
L. H. Caveny and R. A. Biggers Feb. 1984 202 p Proc. held in Lancaster, Calif., 12-15 Mar. 1984
(AF Proj. 2308; AF Proj. 2307)
(AD-A148818; AD-E700011; AFOSR-84-1114TR) Avail: NTIS HC A10/MF A01 CSCL 21/8

This document contains expanded abstracts from the Air Force basic research program on rocket propulsion. The document contains the agenda for the Rocket Research Meeting held at Lancaster, CA on 12-15 March 1984. Major topics include: energetic material combustion, metal combustion, diagnostics of reacting flow, chemical kinetics, thermal properties, synthesis of new ingredients, combustion stability, acoustic interaction, plumes, beamed energy, solar propulsion, and electrical propulsion. (Author).
GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-18086# Oak Ridge National Lab., Tenn.
EMERGING ROLE OF THE NATIONAL LABORATORY IN THE DEVELOPMENT AND TRANSFER OF MATERIALS TECHNOLOGY
H. Postma 1984 15 p refs Presented at 8th Biennial Conf. on Natl. Mater. Policy, Fredricksburg, Va., 11 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001252; CONF-8409156-1) Avail: NTIS HC A02/MF A01

The national laboratories are in a unique position to contribute to the overall national effort in materials Research and Development. The laboratories have the expertise and resources to construct and operate large national facilities for materials research. The laboratories provide a framework for integrating basic research and technology development activities at a common site. National laboratories play important roles in the development and transfer of materials technologies.
DOE

24 COMPOSITE MATERIALS

Includes laminates.

N85-18087 Purdue Univ., Lafayette, Ind.
NONLINEAR ANALYSIS OF COMPOSITE LAMINATES Ph.D. Thesis
Jihn-Kuen Chen 1984 161 p
Avail: Univ. Microfilms Order No. DA8423340

Nonlinear static and dynamic responses of composite laminates were investigated using the finite element method. A nine node isoparametric quadrilateral element was developed to formulate the finite element equations for a laminated plate under initial deformations and initial stresses according to the Mindlin plate theory and von Karman large deflection assumptions. Static large deflection and postbuckling of plates, impact response of a laminate under initial stresses, free vibration and impact response of buckled composite plates, and nonlinear transient and impact analyses of laminated plates with/without initial stresses were studied. In the impact analysis, a experimentally established contact law which accounts for the permanent indentation was employed to calculate the contact force. This contact law was incorporated into the finite element program to study the dynamic response of laminated composites subjected to impact of a hard object. In the nonlinear transient analysis, Newmark time integration algorithm, in conjunction with successive iterations within each time step was used.
Dissert. Abstr.

N85-18088 Drexel Univ., Philadelphia, Pa.
DELAMINATION GROWTH IN GRAPHITE EPOXY LAMINATES UNDER COMPRESSIVE LOADS Ph.D. Thesis
Maria Slomiana 1985 225 p
Avail: Univ. Microfilms Order No. DA8425590

The fracture growth mechanisms of delamination in graphite epoxy laminates which are subjected to compressive in-plane loads are studied. Experiments on laminate coupons of various stacking sequences are conducted in order to observe and identify the loading, geometry and material parameters that influence the growth process of delamination. The test results show that delamination growth under compressive loads is one of the dominant failure modes, in which the laminate internal structure, such as stacking sequence and ply thickness play an important role in the initiation and growth processes of delamination. An analytical model derived from the concept of strain energy release rate is used to describe the various delamination processes. The calculation of the strain energy release rate is based on the theory of ply elasticity, taking into account the exact conditions of laminate loading, the lamination geometry and the overall geometry of the laminate.
Dissert. Abstr.

N85-18089*# Narmco Materials, Inc., Anaheim, Calif.
DEVELOPMENT OF A HETEROGENEOUS LAMINATING RESIN SYSTEM
T. F. Biermann and L. C. Hopper Jan. 1985 44 p
(Contract NAS1-16798)
(NASA-CR-172459; NAS 1.26:172459) Avail: NTIS HC A03/MF A01 CSCL 11D

The factors which effect the impact resistance of laminating resin systems and yet retain equivalent performance with the conventional 450 K curing epoxy matrix systems in other areas were studied. Formulation work was conducted on two systems, an all-epoxy and an epoxy/bismaleimide, to gain fundamental information on the effect formulation changes have upon neat resin and composite properties. The all-epoxy work involved formulations with various amounts and combinations of eight different epoxy resins, four different hardeners, fifteen different toughening agents, a filler, and a catalyst. The epoxy/bismaleimide effort improved formulations with various amounts and combinations of nine different resins, four different hardeners, eight different toughening agents, four different catalysts, and a filler. When a formulation appeared to offer the proper combination of properties required for a laminating resin Celion 3K-70P fabric was prepregged. Initial screening tests on composites primarily involved Gardner type impact and measurement of short beam shear strengths under dry and hot/wet conditions.
R.S.F.

N85-18090# Naval Ship Research and Development Center, Annapolis, Md. Ship Materials Engineering Dept.
THE FABRICATION, PROCESSING AND CHARACTERIZATION OF MULTIDIMENSIONALLY BRAIDED GRAPHITE/EPOXY COMPOSITE MATERIALS Final Report
Aleksander B. Macander, Roger M. Crane, and Eugene T. Camponeschi, Jr. Oct. 1984 52 p
(AD-A148729; DTNSRDC/SME-84-66) Avail: NTIS HC A04/MF A01 CSCL 11/4

This report describes research concerning the braiding, resin impregnation and characterization of multidimensionally braided fiber reinforced composite materials. These materials are an alternative to conventional laminated composite structures and have the potential for being more damage tolerant. The braiding process in initially described, indicating the methodology used and the potential applications for this material. Next, three processes are described which have been used for resin impregnation of the multidimensionally braided panels characterized in this study. Two were resin transfer techniques utilizing vacuum or pressure as the transferring machanism while the third was a resin film lamination technique. While all three methods are presented, the latter technique was chosen for impregnating the test specimens due to the consistently low void content and superior surface quality achieved. Three graphite fiber systems were used in this investigation. These were braided into panels in which three braid parameters could be investigated. The variables investigated include the effect of edge condition, braid pattern, and tow size on the tensile, compressive, flexural and interlaminar shear properties. These properties were obtained in the braid direction only. GRA

N85-18091# Los Alamos Scientific Lab., N. Mex.
FABRICATION OF SiC WHISKERS AND COMPOSITES
G. F. Hurley, P. D. Shalek, F. D. Gac, and J. J. Petrovic 1984 24 p refs Presented at the Conf. on Metal and Ceram. Matrix Composite Process., Columbus, Ohhio, 12 Nov. 1984
(Contract W-7405-eng-36)
(DE85-002038; LA-UR-84-2936; CONF-8411102-1) Avail: NTIS HC A02/MF A01

The Los Alamos Structural Ceramics Program is a multifaceted program with an overall objective of producing superior strength and fracture toughness in ceramic bodies for load bearing applications. One phase of the program is pursuing the development of silicon carbide whiskers which are used to prepare ceramic matrix composites. The purpose of this work is to investigate strengthening and toughening mechanisms in ceramic composites. Aimed at better characterization by the whisker growth process are discussed. The whiskers were used in the preparation of four types of ceramic matrix representative of a range of materials. The nature and reasons for choosing these materials are described. Composites were prepared by dry blending followed by hot pressing which yields high density bodies. In addition, an investigation of wet processing (slip casting) to produce a silicon-silicon carbide body which will be reaction sintered in nitrogen is discussed. DOE

N85-18092# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
FRACTURE MECHANICS ANALYSIS AND PREDICTION OF DELAMINATION GROWTH IN COMPOSITE STRUCTURES
Anders F. Blom Sep. 1984 15 p refs Presented at 2nd Intern. Conf. on Fatigue and Fatigue Thresholds FATIGUE 84, Birmingham, UK, 3-7 Sep. 1984
(Contract FMV-FlygFl-82260-83-053-25-001)
(FFA-TN-1984-45) Avail: NTIS HC A02/MF A01

A model for analysis of delamination growth in composite structures is suggested. The model predicts delamination growth from the range in total strain energy release rate, experimentally obtained by compliance measurements and nondestructive measurements of delamination areas. The model is found to provide reasonable predictions of compressive fatigue behavior in notched carbon/epoxy laminates. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-18093 Ohio State Univ., Columbus.
NMR STUDY ON ROTATIONAL FLUCTUATION IN SOLID HYDROGEN AND DEUTERIUM Ph.D. Thesis
Shin-Il Cho 1984 180 p
Avail: Univ. Microfilms Order No. DA8426370

Low concentration ortho-hydrogen and para-deuterium in solid phase were studied by various proton NMR measurements. The FID's and lineshapes, solid echoes, T sub 1 and echo decay times were obtained as functions of temperature from 4K to 0.05K in the low concentration of oH2 and from 4K to 0.1K in the low concentration of pD2 solids as well as concentration. The FID's in the hydrogen samples (0.2-1.0%) showed the pairing process below 0.1K. For the deuterium solids (4%) various NMR pulses sequences were applied to study the rotational substates of J=1 molecules. Data obtained in those experiments were then compared with the results of others and theories. From those experiments it was found that the rotational fluctuation in solid echo measurements was very important especially in the long pulse interval to understand the echo formation. Dissert. Abstr.

N85-18094 Illinois Univ., Chicago.
COMBUSTION DRIVEN OSCILLATION OF DUCTED DIFFUSION FLAME Ph.D. Thesis
Huei-Nan Chi 1984 253 p
Avail: Univ. Microfilms Order No. DA8426240

A Combustion driven oscillation of ducted diffusion flame is developed to predict the acoustic field generatad by a turbulent diffusion flame, confined within a cylindrical combustor. A pertubative analysis is developed to predict the pressure, velocity and temperature fluctuations generated by the turbulent Bruke-Schumann diffusion flame with prescribed turbulent fluctuation heat release rate. Results of the analysis reveal that the amplitudes of the oscillations are proportional to the combustion sound number which represents the ratio of the characteristic nonsteady heat release to that of thermal convection. A parametric sensitivity study is carried out to assess the pressure and velocity fluctuations under various firing conditions. Detailed time dependent flame is predicted at selected phase of an oscillation cycle. Additionally, the characteristics of hot spot are also investigated. Dissert Abstr.

N85-18095 Illinois Univ., Chicago.
SWIRLING TURBULENT SPRAY GROUP COMBUSTION Ph.D. Thesis
Li-Fong Chuang 1984 275 p refs
Avail: Univ. Microfilms Order No. DA8426241

A swirling turbulent spray group combustion model with general elliptic governing equations has been developed in the present study for an axi-symmetric cylindrical combustor. The influence of collective behavior of droplets to the combustion system is emphasized. The effects of fuel air mass ratio, swirl intensity and spray angle on the principal combustion characteristics are studied. n-Octane (C8N18) is used as the burning fuel in the combustion chamber. Highlights of the study are to be briefed as follows: two principal spray group combustion modes namely, external and internal group combustion modes that may occur in the spray combustion systems are identified. The external group combustion flame which is located outside of the liquid spray is the principal combustion flame in practical combustion systems. Instead, the combustion flame in internal group combustion mode will penetrate into the liquid spray and forms a dispersed flame region among the droplets in the spray. Predicted spray structure and distributions of combustion characteristics are in good agreement with the experimental results. Dissert. Abstr.

N85-18096 Notre Dame Univ., Ind.
SPONTANEOUS IGNITION OF ORGANIC SOLIDS BY RADIANT HEATING Ph.D. Thesis
Pravinray D. Gandhi 1984 266 p
Avail: Univ. Microfilms Order No. DA8425530

The dissertation is aimed at an analytical study of the problem of spontaneous ignition of radiantly heated organic solids. To this end an integral approach is developed (a modification of Karman-Pohlhause-Goodman methods), to account for the shift in the gas phase temperature profile due to distributed chemical oxidation of the pyrolyzate in the boundary layer. The theory models: (1) transient solid conduction, (2) solid decomposition, and the thermal effect of internal convection of the pyrolyzate, (3) reradiation from the solid surface, (4) transient natural convection in the boundary layer, and (5) finite rate kinetics for oxidation of pyrolyzates. It ignores diathermancy of the solid, attenuation of incident radiation by gas participation, and the variation of properties with temperature or composition. The transient conjugate heat and mass transfer model is employed to solve the inert solid problem (no pyrolysis or oxidation reaction) with Uniform Wall Temperature and Uniform Heat Flux as the boundary conditions to yield results consistent with the well-established experimental and analytical solutions available in the literature. Dissert. Abstr.

N85-18097*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MULTIPLEX GAS CHROMATOGRAPHY FOR USE IN SPACE CRAFT
Jose R. Valentin Jan. 1985 91 p refs
(NASA-TM-86668; NAS 1.15:86668) Avail: NTIS HC A05/MF A01 CSCL 07D

Gas chromatography is a powerful technique for the analysis of gaseous mixtures. Some limitations in this technique still exist which can be alleviated with multiplex gas chromatography (MGC). In MGC, rapid multiple sample injections are made into the column without having to wait for one determination to be finished before taking a new sample. The resulting data must then be reduced using computational methods such as cross correlation. In order to efficiently perform multiplexgas chromatography, experiments in the laboratory and on board future space craft, skills, equipment, and computer software were developed. Three new techniques for modulating, i.e., changing, sample concentrations were demonstrated by using desorption, decomposition, and catalytic modulators. In all of them, the need for a separate gas stream as the carrier was avoided by placing the modulator at the head of the column to directly modulate a sample stream. Finally, the analysis of an environmental sample by multiplex chromatography was accomplished by employing silver oxide to catalytically modulate methane in ambient air. Author

N85-18098# Case Western Reserve Univ., Cleveland, Ohio.
ELECTROCHEMICAL INTERFACES AND ELECTRODE PROCESSES Final Report, 1 Jan. 1976 - 31 Mar. 1983
E. B. Yeager 15 Aug. 1984 37 p
(Contract N00014-75-C-0953)
(AD-A147414) Avail: NTIS HC A03/MF A01 CSCL 07/4

This report summarizes ONR research on the development and use of spectroscopic techniques for the study of electrochemical interfaces and electrode processes occurring at such interfaces. A number of in-situ techniques have been used including ultraviolet-visible reflectance spectroscopy and ellipsometry, infrared attenuated total reflectance spectroscopy, surface enhanced and resonant Raman spectroscopy, and Mossbauer spectroscopy. These in-situ techniques have provided important insight into the electronics and the properties of adsorbed molecules, ions and atoms at electrochemical interfaces. They have also been used to examine the adsorption isotherms and kinetics of adsorption-desorption. The in-situ techniques, however, are insufficient to establish the type of adsorption sites or compositional questions. For this reason substantial use has also been made of ex-situ surface physics techniques including LEED, AES, XPS and secondary ion mass spectroscopy. Special hardware and techniques have been developed as part of the ONR contract research to facilitate the transfer of electrodes between the electrochemical and ultrahigh vacuum environments and vice versa with the possibility for restructuring and for keeping contamination at a minimum. The report describes the application of these techniques to adsorption on single crystal electrodes. Author (GRA)

N85-18099# Georgia Univ., Athens. Dept. of Chemistry.
ISOMER ENUMERATION IN POLYTERTIARY PHOSPHINES AND RELATED COMPOUNDS
R. B. King and D. H. Rouvray 24 Oct. 1984 18 p Submitted for Publication
(Contract N00014-84-K-0365; NR Proj. 051-861)
(AD-A148058; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/3

A graph-theoretical approach is adopted for the complete systematization and enumeration of all the possible polytertiary phosphine structures of various types. The three differing types of structural variations in the polytertiary phosphines and related compounds involve: (1) substitution of one or more of the phosphorus atoms by other group V atoms; (2) the presence of two or more types of bridging groups; and (3) the presence of two or more differing terminal groups. In determining appropriate cycle indices for each of these structural types, the number of isomers for each is automatically generated. GRA

N85-18100# Wayne State Univ., Detroit, Mich. Dept. of Chemistry.
EFFECTS OF HETEROATOM SUBSTITUENTS ON THE PROPERTIES OF 1,2-DIOXETANES
Richard L. Handley, Alan J. Stern, and A. Paul Schaap 4 Dec. 1984 7 p
(Contract N00014-82-K-0696; NR Proj. 051-840)
(AD-A148727; ONR-TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

Nitrogen and sulfur-substituted dioxetanes exhibit dramatically lower activation energies for decomposition compared to the corresponding oxygen-bearing dioxetane. A mechanism involving intramolecular electron-transfer processes is proposed for the cleavage of these unstable dioxetanes. Author (GRA)

N85-18101# Exxon Research and Engineering Co., Linden, N.J. Corporate Research-Technology Feasibility Center.
RADIATION/CATALYTIC AUGMENTED COMBUSTION Final Scientific Report, 1 Apr. 1981 - 31 Mar. 1983
A. E. Cerkanowicz and I. D. Crane May 1984 108 p
(Contract F49620-81-C-0028; AF Proj. 2308)
(AD-A148758; AFOSR-84-1129TR) Avail: NTIS HC A06/MF A01 CSCL 21/5

Two novel concepts for extending aircraft operational range have been researched under this contract. They are radiative and catalytic augmentation techniques. The feasibility of utilizing these techniques to alter (augment) combustion initiation and reaction kinetics which restrict combustor operation via limits on flammability, flame propagation, ignition and stability has been investigated. Both techniques have demonstrated the potential to improve combustion processes. The radiative technique under laboratory static conditions has successfully ignited fuel-air mixtures, and has enhanced combustion processes, utilizing pulsed and continuous vacuum ultraviolet light sources. Similarly, the catalytic technique has broadened stability limits under normally difficult fuel lean, low temperature conditions. Complementary efforts have focused on the developement of analytical capabilities required for modeling the radiative and catalytic techniques. Author (GRA)

N85-18102# California Univ., Berkeley. Dept. of Mechanical Engineering.
FLAME PROPAGATION AND STABILIZATION STUDIES USING RAYLEIGH SCATTERING AND LASER DOPPLER VELOCIMETRY Final Report, 2 May 1982 - 1 May 1984
L. Talbot and F. Robben 15 Jun. 1984 7 p
(Contract F49620-80-c-0065)
(AD-A148802; AFOSR-84-1128TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

Studies of premixed turbulent flame propagation have been

carried out using laser tomography, two-point Rayleigh scattering, and combined Rayleigh-LDV single point measurements. Probability density functions of intermediate states, correlation coefficients and correlation length scales within the reaction zone have been measured. A theoretical model has been developed which predicts these quantities, and very good agreement between theory and experiment is obtained. GRA

N85-18103# Argonne National Lab., Ill.
PHOTOIONIZATION OF EXCITED MOLECULAR STATES
P. M. Dehmer, J. L. Dehmer, and S. T. Pratt 1984 11 p refs Presented at the 3rd Intern. Conf. on Multiphoton processes, Iraklion, Greece, 4 Sep. 1984
(Contract W-31-109-eng-38)
(DE84-017454; CONF-8409129-1) Avail: NTIS HC A02/MF A01

Studies of H2 and N2 are reported. The results reflect both the spectroscopy and the dynamics of photoionization of excited molecular states and are discussed in terms of the selection rules for photoionization and the relative probabilities of photoionization from Rydberg and valence states. In some cases, in accordance with the Franck-Condon principle, it is demonstrated that resonant multiphoton ionization through Rydberg states may be a powerful technique for the production of electronic, vibrational, and rotational state selected ions. However, in other cases, systematic departures from Franck-Condon behavior are observed, which reflect the more subtle dynamics of excited state photoionization. DOE

N85-18104# Universal Oil Products Co., Des Plaines, Ill.
ADVANCED NMR CHARACTERIZATION OF ZEOLITE CATALYSTS Quarterly Report, 1 Jun. - 31 Aug. 1984
L. B. Welsch Sep. 1984 7 p refs Prepared in cooperation with Illinois Univ.
(Contract DE-FG22-83PC-60779)
(DE85-000456; DOE/PC-60779/4) Avail: NTIS HC A02/MF A01

The program discussed in this report is a two-year two-phase joint UOP-University of Illinois study of the application of improved high resolution solid state nuclear magnetic resonance (NMR) techniques to the characterization of zeolite catalysts. During the first phase of this program very pure, and in some cases isotopically enriched faujasites will be prepared and studied by magic angle sample spinning NMR (MAS NMR) and variable angle sample spinning NMR (VASS NMR) on 500 and 360 MHz (Proton frequency) NMR spectrometers. The NMR techniques that will be emphasized are the measurement and analysis of the (17)O NMR properties, (27)A1 NMR intensity quantitation, and (27)Al and (29)Si NMR relaxation rates. During the second phase of this program these NMR techniques will be used to study the effects of impurity concentration, dealumination treatments and cation exchange on the NMR properties of faujasites. The initial emphasis of this program during Phase I is on the preparation and measurement of the NMR properties of (17)O enriched Na-Y faujasite. The main efforts during the fourth three-month period of the program continue to be the characterization of the (17)O enriched zeolites, particularly X and Y zeolites, by both static and sample spinning (17)O NMR. DOE

N85-18105# Catholic Univ. of America, Washington, D.C. Dept. of Mechanical Engineering.
MEASUREMENT AND CONTROL OF ELECTROSTATIC CHARGES ON SOLIDS IN A GASEOUS SUSPENSION Technical Progress Report, 15 Jul. - 30 Sep. 1984
S. Nieh and T. Nguyen Oct. 1984 21 p refs
(Contract DE-FG22-84PC-70778)
(DE85-001450; DOE/PC-70778/T1; TPR-1) Avail: NTIS HC A02/MF A01

The work performed during the period of July 15 (project starting date) to September 30, 1984 is summarized. An improved continuous two-phase test loop with a cyclone-venturi configuration was designed, fabricated, and installed at the Mechanical Engineering Department, CUA. It is made of a uniform material (copper), and is specifically designed for studying the electrostatic charging and control of powders. Steady flows of solid-gas suspensions with conveying velocity up to 28 m/s can be achieved at the horizontal test section. The design feature and performance of this loop are presented. A preliminary design of the upgraded Faraday cage for measuring the individual particle charge was also made. Efforts in developing the associated signal processing circuits and testing the Faraday cage system are to continue.DOE

N85-18106# California Univ., Berkeley. Lawrence Berkeley Lab.
APPLICATION OF TUNABLE MONOCHROMATIC SYNCHROTRON RADIATION TO THE QUANTITATIVE DETERMINATION OF TRACE ELEMENTS
R. D. Giaugue, J. M. Jaklevic, and A. C. Thompson Sep. 1984 11 p refs Presented at Advan. in X-ray Analysis Conf., Denver, 30 Jul. 1984
(Contract DE-AC03-76SF-00098)
(DE85-001271; LBL-17779; CONF-840799-2) Avail: NTIS HC A02/MF A01

The advantages of using monochromatic polarized synchrotron radiation sources for energy dispersive X-ray fluorescence analysis have been demonstrated in terms of reduced scattering, better selectivity for specific elements, and sensitivity for the analysis of small samples. The importance of the kinematic behavior of matrix scattered radiation on the sensitivity for the specific elements has been emphasized. Accurate calibration curves have been developed and the quantitative analysis of standard samples has been demonstrated. DOE

N85-18107# California Univ., Berkeley. Lawrence Berkeley Lab.
TRANSMISSION ELECTRON MICROSCOPY OF INORGANIC MATERIALS
G. Thomas Jun. 1984 52 p refs Presented at the 3rd Asian Pacific Conf. and Workshop on Electron Microscopy, Singapore, 24 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000708; LBL-18027; CONF-8408117-1) Avail: NTIS HC A04/MF A01

This brief summary attempts to illustrate how the sophisticated methods of electron microscopy and chemical microanalysis can be applied to practical, industrial problems is discussed. Since these problems are generic, the methods apply equally well to all materials but the discussion is limited to inorganic materials illustrated with representative examples of research on steels, ceramics and electronic materials. DOE

N85-18108# Pittsburgh Univ., Pa. Dept. of Chemical and Petroleum Engineering.
CATION PROMOTION EFFECTS IN ZEOLITE-SUPPORTED F-T CATALYSTS Quarterly Report, Jun. - Aug. 1984
J. G. Goodwin, Jr. and A. Sayari Sep. 1984 10 p refs
(Contract DE-FG22-83PC-60805)
(DE85-001708; DOE/PC-60805/T4; QR-4) Avail: NTIS HC A02/MF A01

During this quarter, June 1, 1984, to August 31, 1984, investigations focussed on two main tasks: CO hydrogenation and cyclopropane hydrogenation. CO hydrogenation was performed at atmospheric pressure and in the temperature range 220 to 300 C. The catalysts used were Ru supported on the following zeolites: NaY, LiY, KY, CsY, RbY, HY, NaX, and KL. All catalysts were analyzed by atomic absorption and found to contain 3 or 0.1 wt% Ru. The following features are discussed: activity and selectivity; dependence of the olefin fractions upon the nature of the support; and relationships between the composition of C4 fractions, and the support acidity. Another microreactor system was constructed for performing cyclopropane hydrogenation over a series of 0.15 wt% Ru/zeolites. DOE

N85-18109# Argonne National Lab., Ill. Mathematics and Computer Science Div.
BURNER STABILIZED FLAMES IN FLUIDS
Hans G. Kaper, Gary K. Leaf, Moshe Matalon (Northwestern Univ., Evanston, Ill.), and Bernard J. Matkowsky Jul. 1984 53 p refs
(Contract W-31-109-ENG-38)
(DE84-017429; ANL-84-47) Avail: NTIS HC A04/MF A01

It is shown that a burner placed in a combustible fluid can

have a stabilizing effect on a plane flame. A mathematical model is derived in which the flame is modeled as a surface of discontinuity in the flow field. Jump conditions for the fluid variables, as well as an expression for the flame speed, are obtained from an asymptotic analysis of the detailed structure of the flame. The model is applied to investigate the linear stability of a plane flame. Stable behavior is shown to exist for certain regimes of the parameters: Lewis number, burner strength, heat release and inflow velocity. DOE

N85-18110# Oak Ridge National Lab., Tenn.
MASS SPECTROMETRY/MASS SPECTROMETRY AS A SCREENING METHOD FOR DETECTING EXPLOSIVE VAPORS
G. L. Glish, S. A. McLuckey, and J. A. Carter 1984 4 p refs Presented at 25th Ann. Meeting of the Inst. of Nucl. Materials Management, Columbus, Ohio, 15 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001276; CONF-840734-21) Avail: NTIS HC A02/MF A01

Mass spectrometry/mass spectrometry (MS/MS) is a relatively new technique for trace analysis. This technique has great potential for the identification of explosive vapors. A brief overview is given of MS/MS with emphasis on the characteristics that make it a likely method for explosive detection. Some preliminary data are presented and a new MS/MS instrument being designed and built for detection of trace explosive vapors is discussed. DOE

N85-18111# Oak Ridge National Lab., Tenn.
PHOTOACOUSTIC SPECTROSCOPY AT ELECTRODE-SOLUTION INTERFACE
C. E. Vallet and G. M. Brown 1984 13 p refs Presented at 12th DOE Surface Sci./SUBWOG 7, SUBWOG 12B Tech. Exchange Meeting, Oak Ridge, Tenn., 11 Jun. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001872; CONF-840617-8) Avail: NTIS HC A02/MF A01

Photoacoustic spectroscopy, coupled with electrochemical measurements, can be used to monitor film formation and breakdown during corrosion passivation. A two-beam photoacoustic-electrochemical spectrometer was built. The spectrometer was tested using holmium oxide and titanium oxide, and then it was used to study the passivation of titanium in sulfuric acid solutions. DOE

N85-18112# Massachusetts Inst. of Tech., Cambridge.
TURBULENT PREMIXED FLAME STUDY Progress Report, 1 Dec. 1983 - 15 Oct. 1984
W. Cheng, J. Keck, S. Pope, E. Hainsworth, and K. Lin 30 Oct. 1984 29 p refs
(Contract DE-AC02-83ER-13038)
(DE85-003220; DOE/ER-13038/T1) Avail: NTIS HC A03/MF A01

Turbulent premixed flames were investigated. The program includes an effort to measure the pertinent properties of a statistically spherical flame propagating in a turbulent environment, and a theoretical effort based on the solution of the probability density function (pdf) of a progressive variable of the reacting system by the Monte Carlo method. The apparatus and instrumentation of the experiment was set up; the basic computer program for the Monte Carlo calculation was written; and progress in both the experimental and theoretical effort was made. Experimental data on the characteristic of the turbulent flow in terms of hot wire velocity measurements, and the flame development in terms of high speed Schlieren movies were obtained. The flame Schlieren image recorded on film showed a highly irregular structure, and, in some cases, the flame kernel extinguished. The pdf formulation was generalized from a plane to a spherical geometry, and the density was no longer assumed to be constant to account for the thermal expansion of the combustion products. Calculation for a statistically spherical flame similar to the experimental condition was completed. DOE

N85-18113# Brigham Young Univ., Provo, Utah. Dept. of Chemical Engineering.
METAL-SUPPORT INTERACTIONS: THEIR EFFECTS UPON ADSORPTION, ELECTRONICS, AND ACTIVITY/SELECTIVITY PROPERTIES OF COBALT IN HYDROGENATION Annual Progress Report, 1 Apr. 1984 - 31 Mar. 1985
Calvin H. Bartholomew 1 Apr. 1985 6 p refs
(Contract DE-AC02-81ER-10855)
(DE85-003316; DOE/ER-10855/4) Avail: NTIS HC A02/MF A01

The interactions of cobalt with alumina, silica, titania, magnesia, and carbon supports were investigated. Accomplishments are summarized on four research topics: (1) effects of dispersion percentage reduction, and preparation on activity/selectivity properties of cobalt; (2) effects of support and dispersion on activity/selectivity properties of iron; (3) effects of support and dispersion on the binding states and binding energies of CO on Co; and (4) effects of support on electronic properties of Co and Fe are described. DOE

N85-18114# Utah Univ., Salt Lake City. Dept. of Chemistry.
DYNAMICS AND MECHANISMS OF CATALYTIC PROCESSES AND HOT CHEMISTRY Final Report, 1 Mar. 1972 - 31 Oct. 1984
Leonard D. Spicer Oct. 1984 20 p refs
(Contract DE-AC02-76ER-02190)
(DE85-002899; DOE/ER-02190/4) Avail: NTIS HC A02/MF A01

General areas of research addressed are recoil chemistry of halogens, tritium, and sulfur, radiotracer methods for studies of chemical dynamics, thermal and photochemistry of sulfur dioxide, and photochemistry and photoassistance in catalytic systems. DOE

N85-18115# Brigham Young Univ., Provo, Utah.
SUPERCRITICAL FLUID CHROMATOGRAPHY/SUPERSONIC JET SPECTROSCOPY Progress Report, 1 Aug. - 31 Oct. 1984
Milton L. Lee and Steven R. Goates Nov. 1984 14 p
(Grant DE-FG22-83PC-60807)
(DE85-003310; DOE/PC-60807/5) Avail: NTIS HC A02/MF A01

Supercritical fluid extraction/fractionation was demonstrated to provide ring-number fractionation of polycyclic aromatic hydrocarbon (PAH) materials of approximately the same efficiency as obtained by semi-preparative liquid chromatography. Furthermore, extraction and fractionation occur in the same operation, and solvent removal is greatly simplified when using supercritical CO2. Assembly of the large vacuum expansion chamber and the pump-beam steering and collection optics for supersonic jet spectroscopy was completed. The entire apparatus was tested, and operates well. A heated nozzle arrangement for the interface between the supercritical fluid chromatograph and vacuum chamber was also constructed. DOE

N85-18116# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
THERMODYNAMIC PROPERTIES OF AQUEOUS NaCl FROM 273 TO 823 K WITH ESTIMATES FOR HIGHER TEMPERATURES
Kenneth S. Pitzer Jul. 1984 42 p refs Presented at the Intern. Conf. on the Properties of Steam, Moscow, 3-7 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000392; LBL-18183; CONF-8409140-1) Avail: NTIS HC A03/MF A01

Equations based on theory, to the degree feasible, are developed which represent the various thermodynamic properties of aqueous NaCl. In the range 273 to 573 K, 0 to 1 kbar, and to saturation molality, the experimental data base is excellent. An equation based on a virial expansion and a Debye-Hueckel term represents the data accurately. This form of equation has been generalized to multicomponent systems; hence these results are readily extended to complex brines as the properties for other components become known. In the range above 573 K the data are more limited and of less accuracy, but a comprehensive treatment is still possible. The equation is one used before for ionic systems miscible to a fused salt. The supercooled liquid NaCl is taken as a reference state. The equation is valid from 423 to 823 K and thus has an extensive overlap with the lower-temperature equation. Estimates are also presented for temperatures above 823 K. DOE

N85-18117# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials Science.
MECHANISMS OF GAS PERMEATION THROUGH POLYMER MEMBRANES Progress Report, 1 Jul. 1983 - 31 May 1984
S. A. Stern, G. R. Mauze, and S. R. Sampat Jul. 1984 18 p refs
(Contract DE-AC02-78ER-05015)
(DE84-017423; DOE/ER-05015/T2) Avail: NTIS HC A02/MF A01

The free volume and dual-mode sorption models were found to offer a satisfactory formalism for describing the solution/sorption and transport of gases and vapors in rubbery and glassy polymers, respectively. A generalized model incorporating features of both models was developed. Both specialized models were tested for rubbery and glassy polymers. DOE

N85-18118# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials Science.
METAL-SUPPORT INTERACTIONS: THE EFFECT OF CATALYST PREPARATION ON CATALYTIC ACTIVITY Progress Report, 1 Dec. 1983 - 30 Nov. 1984
J. A. Schwarz 1984 6 p
(Contract DE-AC02-84ER-13158)
(DE84-017425; DOE/ER-13158/T1) Avail: NTIS HC A02/MF A01

Activies in four major areas are reported. The research areas include: (1) experimental study of the effect of the wet chemical steps involved in the preparation of a known strong-metal support interaction system (SMSI), namely Pt/TiO2; (2) experimental study of the effect of added acids and bases on the formation of a prototype bimetallic catalyst system, namely, Pt/Ir/Al2O3; (3) theoretical study of the limitations of treating a differential catalyst bed operating under transient conditions as an ideal continuous stirred-tank reactor; and (4) preparation of 30 Ni/Al203 catalysts. During preparation the weight loading and pH were varied systematically and thus nickel speciation as Ni(++) or Ni(OH) (+) in the electrolyte was controlled. DOE

N85-18119# Oak Ridge National Lab., Tenn. Chemistry Div.
HYDROLYSIS OF IODINE: EQUILIBRIA AT HIGH TEMPERATURES
Donald A. Palmer, Richard W. Ramette (Carleton College, Northfield, Minn.), and Robert E. Mesmer 1984 7 p refs Presented at the Conf. on Thermodynamics, Hamilton (Canada), 13 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE84-016713; CONF-840807-4) Avail: NTIS HC A02/MF A01

The hydrolysis (or disproportionation) of molecular iodine to form iodate and iodide ions was studied by emf measurements over the temperature range, 3.8(0) to 209.0(0)C. The interpretation of these results required a knowledge of the formation constant for triiodide ion and the acid dissociation constant of iodic acid, both of which were measured as a function of temperature. The resulting thermodynamic data was incoporated into a general computer model describing the hydrolysis equilibria of iodine as a function of initial concentration, pH, and temperature. DOE

N85-18120# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
REACTIONS OF METAL IONS AND THEIR CLUSTER IN THE GAS PHASE USING LASER IONIZATION: ION CYCLOTRON RESONANCE SPECTROSCOPY Progress Report, 1 Jul. 1983 - 30 Jun. 1984
B. S. Freiser Mar. 1984 26 p refs
(Contract DE-AC02-80ER-10689)
(DE84-016491; DOE/ER-10689/4) Avail: NTIS HC A03/MF A01

Progress in the study of metal ion chemistry in the gas phase using the combined laser desorption - Fourier transform mass spectrometer technique is discussed. The highlights of the work from the first three years of funding by DOE are summarized. Five new areas initiated this past year which are the basis of much of the proposed work in the renewal proposal are discussed. DOE

N85-18121# McElroy (Ralph) Co., Austin, Tex.
PRODUCTION OF CONCENTRATED NITRIC ACID
Y. M. Kargin, A. A. Chichirov, O. V. Parakin, E. V. Nikitin, A. P. Tomilov, G. N. Marchenko, G. G. Garifzyanov, V. V. Volkov, A. V. Smolentsev, and V. P. Dobrynin 1984 9 p Transl. into ENGLISH of Russian Patent no. 1059023 A (7 Dec. 1983)
(Contract W-7405-eng-48)
(DE84-017191; UCRL-Trans-12001) Avail: NTIS HC A02/MF A09

A method of production of concentrated nitric acid by oxidation of a nitrogen-containing compound is distinguished by the fact that, with the goal of increasing the yield of the acid and simplifying the process, dilute nitric acid is oxidized electrochemically in a membrane cell on anodes of platinum, glass carbon or metal oxide electrodes on a titanium base at a maximum current density of 50 A/dm(2). Dioxides of ruthenium, lead and manganese, cobalt trioxide on a titanium base are used as the metal oxide electrodes. DOE

N85-18122# Technical Research Centre of Finland, Espoo. Nuclear Engineering Lab.
THERMAL RADIATION HAZARDS FROM LIQUIFIED PETROLEUM GAS (LPG) FIREBALLS
Jouni P. Partanen and Matti Vuorio Aug. 1984 35 p refs
(VTT-304; ISBN-951-38-2025-4; ISSN-0358-5077) Avail: NTIS HC A03/MF A01; Technical Research Centre of Finland, Espoo FIM 30

Cooling of turbulently burning fuel-rich fireballs by thermal radiation and by mixing with ambient cold air is discussed. Analytical models indicate that mixing dominates over radiation. The empirical, thermally radiating fraction of the energy from experimentally available fireball sizes is extrapolated to masses relevant in industrial accidents by scaling fireball radius, and its burning and cooling time with the released fuel mass (Mf). The radiating fraction turns out to be a weakly decreasing function of Mf. Health hazards to people from thermal radiation at different distances as a function of Mf are estimated. Author (ESA)

N85-18123# Rolls-Royce Ltd., Derby (England).
AROMATICS DETERMINATION IN MIDDLE DISTILLATE PETROLEUM FRACTIONS BY SPECTROPHOTOMETRIC TITRATION
K. Kovatscheva 14 Nov. 1984 10 p refs Transl. into ENGLISH from J. fuer Prakt. Chem. (Leipzig), v. 326, no.6, 1981 p 1003-1008
(PNR-90239; Trans-16619/TLT-00920) Avail: NTIS HC A02/MF A01

Use of the infrared spectrophotometric titration (IRT) method to determine the total aromatics in light (160 to 270 C) and heavy (210 to 360 C) diesel fuel fractions is discussed. The IRT method is more accurate than the standard method. Analysis of an industrial hydrocarbon mixture shows a greater difference between results from the IRT method and gravimetric analysis. Data on the accuracy of the results of aromatics determination by gravimetric analysis explain the large random error of the sulfuric acid method and show that use of this method in unsuitable. The results obtained by the IRT method are therefore better. The greater reproducibility of the IRT method compared with gravimetric analysis is revealed by Fischer tests. Author (ESA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-18124*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A STUDY OF SPECTRUM FATIGUE CRACK PROPAGATION IN TWO ALUMINUM ALLOYS. 1: SPECTRUM SIMPLIFICATION
Jack Telesman and Stephen D. Antolovich (Georgia Inst. of Technology) Jan. 1985 16 p refs 2 Vol.

(NASA-TM-86929; E-2348; NAS 1.15:86929) Avail: NTIS HC A02/MF A01 CSCL 11F

The fatigue crack propagation behavior of two commercial Al alloys was studied using spectrum loading conditions characteristics of those encountered at critical locations in high performance fighter aircraft. A tension dominated (TD) and tension compression (TC) spectrum were employed for each alloy. Using a mechanics-based analysis, it was suggested that negative loads could be eliminated for the TC spectrum for low to intermediate maximum stress intensities. The suggestion was verified by subsequent testing. Using fractographic evidence, it was suggested that a further simplification in the spectra could be accomplished by eliminating low and intermediate peak load points resulting in near or below threshold maximum peak stress intensity values. It is concluded that load interactions become more important at higher stress intensities and more plasticity at the crack tip. These results suggest that a combined mechanics/fractographic mechanisms approach can be used to simplify other complex spectra. M.G.

N85-18125*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A STUDY OF SPECTRUM FATIGUE CRACK PROPAGATION IN TWO ALUMINUM ALLOYS. 2: INFLUENCE OF MICROSTRUCTURES

Jack Telesman and Stephen D. Antolovich (Georgia Inst. of Technology) Jan. 1985 19 p refs 2 Vol.

(NASA-TM-86930; E-2439; NAS 1.15:86930) Avail: NTIS HC A02/MF A01 CSCL 11F

The important metallurgical factors that influence both constant amplitude and spectrum crack growth behavior in aluminum alloys were investigated. The effect of microstructural features such as grain size, inclusions, and dispersoids was evaluated. It was shown that a lower stress intensities, the I/M 7050 alloy showed better fatigue crack propagation (FCP) resistance than P/M 7091 alloy for both constant amplitude and spectrum testing. It was suggested that the most important microstructural variable accounting for superior FCP resistance of 7050 alloy is its large grain size. It was further postulated that the inhomogenous planar slip and large grain size of 7050 limit dislocation interactions and thus increase slip reversibility which improves FCP performance. The hypothesis was supported by establishing that the cyclic strain hardening exponent for the 7091 alloy is higher than that of 7050. M.G.

N85-18126*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

REPLACEABLE BLADE TURBINE AND STATIONARY SPECIMEN CORROSION TESTING FACILITY

Gilbert J. Santoro and Frederick D. Calfo Jan. 1985 21 p refs (NASA-TM-86931; E-2371; NAS 1.15:86931) Avail: NTIS HC A02/MF A01 CSCL 11F

A facility was constructed to provide relatively low cost testing of hot section turbine blade and vane materials under hot corrosion conditions more akin to service environments. The facility consists of a small combustor whose pressurized gas flow can be directed to either a test section consisting of three small cascaded specimens or to a partial admittance single-stage axial flow turbine. The turbine rotor contains 28 replaceable turbine blades. The combustion gases resulting from the burning of Jet A-I fuel can be seeded with measured amounts of alkali salts. This facility is described here along with preliminary corrosion test results obtained during the final checkout of the facility. Author

N85-18127*# Michigan Technological Univ., Houghton.

THE EFFECT OF TANTALUM ON THE STRUCTURE/PROPERTIES OF TWO POLYCRYSTALLINE NICKEL-BASE SUPERALLOYS: B-1900 + Hf MAR-M247 M.S. Thesis, Final Report

Gregg M. Janowski Washington Feb. 1985 109 p refs (Grant NAG3-216)

(NASA-CR-174847; NAS 1.26:174847) Avail: NTIS HC A06/MF A01 CSCL 11F

The microstructure, phase compositions, and phase fractions were studied in conventionally cast B-1900 + Hf and both conventionally cast and directionally solidified MAR-M247 as a function of tantalum concentration. The hot tensile and creep rupture properties of the solutionized and aged MAR-M247-type alloys were also determined as a function of tantalum level. The effects of tantalum on the microstructure and phase compositions of B-1900 + Hf and MAR-M247 (conventionally cast and directionally solidified) were found to be very similar. The addition of tantalum to the as cast and heat treated alloys was shown to cause the partial replacement of the Hf in the MC carbides by Ta, although the degree of replacement was decreased by the solutionizing and aging heat treatment. The gamma prime and minor phase fractions (primarily MC type carbides) both increased approximately linearly with tantalum concentration. The gamma prime phase compositions were relatively insensitive to tantalum variations with the exception of the tantalum and/or hafnium levels. Bulk tantalum additions increased the tantalum, chromium, and cobalt levels of the gamma phase in both alloy series. The increase in the concentrations of the latter two elements in the gamma phase was a result of the decrease in the gamma phase fraction with increasing bulk tantalum concentration and constant gamma/gamma prime partitioning ratio. Tantalum additions increased the yield stress and ultimate tensile strength of the directionally solidified MAR-M247 type alloys and had no significant effect on ductility. B.W.

N85-18128# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.

DEFORMATION AND FRACTURE OF P/M (POWDER/METALLURGY) TITANIUM ALLOYS Annual Report, 1 Oct. 1983 - 30 Sep. 1984

D. A. Koss 5 Nov. 1984 26 p

(Contract N00014-76-C-0037)

(AD-A148672; TR-27) Avail: NTIS HC A03/MF A01 CSCL 11/6

Progress is reviewed for a research program whose purpose is to provide a broad-based understanding of the application and consequences of certain advanced processing techniques to high performance alloys in general and to Ti alloys in particular. The research ranges from experimental studies of hot isostatic pressing (HIP) to experimental/analytical modeling of the deformation and fracture of materials with pre-existing porosity. Aspects of the search are also a fundamental study of fracture utilizing engineering materials containing processing-induced defects. Progress for the period October 1, 1983 to September 30, 1984 is reviewed for the following portions of this research program: (1) the influence of porosity on the deformation and fracture of alloys over a wide range of strain rates; (2) the effects of void/pore distributions on ductile fracture as modeled by arrays of holes; (3) hot isostatic pressing of metallic powders; and (4) grain size/stress state effects on the hydrogen embrittlement of titanium. Author (GRA)

N85-18129# Oak Ridge National Lab., Tenn. Fusion Energy Div.

HYDROGEN TRAPPING, DIFFUSION, AND RECOMBINATION IN AUSTENITIC STAINLESS STEELS

Robert A. Langley 1984 27 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14 May 1984

(Contract DE-AC05-84OR-21400)

(DE85-001871; CONF-840520-22) Avail: NTIS HC A03/MF A01

Trapping, diffusion, and recombination of hydrogen in austenitic stainless steels are reviewed. It is suggested that since all of these processes are strongly interdependent and since the measured recombination rates are found to vary four orders of magnitude at any temperature, the data analysis techniques used to date are insufficient. A two-region diffusion model with surface recombination is proposed in which the surface layer is characterized by a smaller diffusion coefficient than the bulk. DOE

N85-18130# Colorado School of Mines, Golden.

SUSCEPTIBILITY OF 2 1/4 Cr-1Mo STEEL TO LIQUID METAL INDUCED EMBRITTLEMENT BY LITHIUM-LEAD SOLUTIONS

B. A. Eberhard and G. R. Edwards Aug. 1984 130 p refs
(Contract W-7405-eng-48)
(DE85-000997; UCRL-15639) Avail: NTIS HC A07/MF A01

An investigation has been conducted on the liquid metal induced embrittlement susceptibility of 2 1/4Cr-1Mo steel exposed to lithium and 1a/o lead-lithium at temperatures between 190 C and 525 C. This research was part of an ongoing effort to evaluate the compatibility of liquid lithium solutions with potential fusion reactor containment materials. Of particular interest was the microstructure present in a weld heat-affected zone, a microstructure known to be highly susceptible to corrosive attack by liquid lead-lithium solutions. Embrittlement susceptibility was determined by conducting ension tests on 2 1/4Cr-1Mo steel exposed to an inert environment as well as to a lead-lithium liquid and observing the change in tensile behavior. The 2 s1/4Cr-1Mo steel was also given a base plate heat treatment to observe its embrittlement susceptibility to 1a/o lead-lithium. The base plate microstructure was severely embrittled at temperatures less than 500 C. Tempering the base plate was effective in restoring adequate ductility to the steel. DOE

N85-18131# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
LOW AND MODERATE TEMPERATURE OXIDATION OF ATOMICALLY CLEAN NICKEL, CHROMIUM AND Ni-Cr ALLOYS Final Report
P. H. Holloway and C. Batich 7 Aug. 1984 5 p refs
(Contract DE-AS05-83ER-45027)
(DE84-017350; DOE/ER-45027/1) Avail: NTIS HC A02/MF A01

The Ni(110) crystal was placed in the system and competitive surface segregation of carbon and phosphorous was observed. After repeated sputter cleaning and heating, the surface concentrations of these segregated species was reduced. Oxygen would also react with these species at elevated temperature. The sample was reacted to form a passivating NiO layer then sputter-profiled using Ar(+) bombardment. The profiles suggest the preferential sputtering of oxygen from NiO and a transition layer of Ni-O between the NiO and Ni substrate. Initial studies of the Ni-Cr alloys utilized a polycrystalline sample. The sample was sputter cleaned and annealed. Again surface segregation of trace impurities was observed. We also observed surface segregation of Cr from the bulk alloy. A passivating oxide was formed on the atomically clean surface, exposed to atmospheric pressure gases, and sputter profiled with AES. DOE

N85-18132# Sandia Labs., Albuquerque, N. Mex.
PLASMA DEPOSITION OF AMORPHOUS METAL ALLOYS
A. K. Hays 1984 8 p refs Presented at the Symp. on the Sci. Basis for Nucl. Waste Management, Boston, 26 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-000768; SAND-84-1163C; CONF-841157-5) Avail: NTIS HC A02/MF A01

Amorphous metal alloy films were produced by the plasma-dissociation of Ni(CO)4 and PH3 in a hydrogen carrier gas. These films possessed relatively low carbon and oxygen contents despite the fact that they were deposited at low temperatures and high RF power densities. The P content of these films was a factor of three greater than the P content of the plasma gas mixtures used to prepare the films. DOE

N85-18133# Oak Ridge National Lab., Tenn.
SURFACE MECHANICAL PROPERTIES AND WEAR BEHAVIOR OF ION IMPLANTED TiB2
C. J. McHargue, C. S. Yust, P. Angelini, P. S. Sklad, and M. B. Lewis 1984 15 p refs Presented at the 2nd Intern. Conf. on the Sci. of Hard Mater., Rhodes, Greece, 23 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001130; CONF-8409117-3) Avail: NTIS HC A02/MF A01

Implantation of Ni into polycrystalline TiB2 produced an altered microstructure to a depth of 750 nm. The implantation damage was in the form of coarse dislocation tangles near the surface and fine damage structure at greater depths. The surface mechanical properties, as measured by Knoop microindentation hardness, indentation fracture toughness, and scratch wear resistance, were increased by 50 to 110% by implantation. During pin on disk tests, entire grains were removed by the process of grain boundary cracking. DOE

N85-18134# Wisconsin Univ., Madison.
STABILITY OF AMORPHOUS METALS ON SEMICONDUCTOR SUBSTRATES Final Report
J. D. Wiley and J. H. Perepezko Jun. 1984 52 p refs
(Contract DE-AC02-82ER-12062)
(DE84-017256; DOE/ER-12062/T1) Avail: NTIS HC A04/MF A01

Both the diffusion measurements and in situ resistance results for gold-NiNb indicate that relaxation type processes are active in the 300 to 400 C temperature range. The diffusion measurements also suggest no differences for samples relaxed at 570 C for 10 hours and at 500, and 540 C for 5 hours. The nature of the gold NiNb interaction during diffusion annealing requires further study. Also, the act that the gold forms a plateau concentration in the region of the gold/NiNb interface suggests the existence of a possible metastable equilibrium state between the crystalline phase forming during interdiffusion and the unreacted underlying amorphous film. Finally the diffusion of Ta and amorphous NiTa into an amorphous NiNb film has been examined by RBS. The diffusion process is much slower than gold diffusion into NiNb and no compound formation was observed. After an initial period of about 7 hours at 505 C no further diffusion was detected for the Ta and NiTa overlayers, suggesting the possibility that surface coatings may act to stabilize the amorphous NiNb film. DOE

N85-18135# Sandia Labs., Albuquerque, N. Mex.
IMPLANTATION OF Ti + C FOR REDUCED FRICTION AND WEAR OF STEELS
D. M. Follstaedt 1984 22 p refs Presented at the 8th Conf. on the Application of Accelerators in Res. and Industry, Denton, Tex., 12 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-001606; SAND-84-1347C; CONF-841117-2) Avail: NTIS HC A02/MF A01

A review of various types of friction and wear tests of ion implanted steels with 10 to 30 at. % Ti and C shows that the implantation reduces wear and unlubricated friction for every steel examined, even for Hertzian contact stresses in excess of the bulk yield strength. The microscopic information on implanted Fe and steels obtained by TEM, Auger analysis and ion beam analysis is presented, and the near surface amorphous alloy discovered in similarly implanted Fe is shown to be closely associated with the benefits obtained with the Ti + C treatment of steels. The implanted layer changes the unlubricated sliding wear mode from adhesive to abrasive, and the increased hardness of the amorphous alloy then promotes wear resistance. Recent results suggest that the optimum alloy is obtained by using a high Ti concentration (30 at. %) and by implanting C to produce as thick an amorphous layer as possible. DOE

N85-18136# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
ELECTRONIC STRUCTURE OF LIQUID METAL ALLOYS
D. Nicholson and A. Chowdhary (Brandeis Univ.) 1984 8 p refs Presented at the High-Temp. Alloys: Theory and Design Conf., Bethesda, Md., 8 Apr. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000904; CONF-840417-4) Avail: NTIS HC A02/MF A01

Medium approximation are used as a basis for discussion of total electronic energies in liquid-metal alloys. Experience gained in investigating the total energies of crystalline metals makes similar studies of structurally disordered metals feasible. An improved understanding of the energetics of the liquid phase will be important in the theoretical construction of high-temperature phase diagrams. DOE

N85-18137# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

ALLOYING EFFECTS AND MICROSTRUCTURE OF IRON ALUMINIDES

J. A. Horton, C. T. Liu, and C. C. Koch 1984 13 p refs Presented at the High-Temp. Alloys: Theory and Design Conf., Bethesda, Md., 8 Apr. 1984

(Contract DE-AC05-84OR-21400)

(DE85-000903; CONF-840417-6) Avail: NTIS HC A02/MF A01

An alloying study of the iron aluminide, Fe3Al, with ternary additions of boron, silicon, copper, or nickel was performed in order to investigate their alloying behavior and associated microstructures. It was found that additions of boron had virtually no effect on the ductility and fracture behavior of Fe3Al. Although silicon and copper increased the yield stress and hardness both elements were found to embrittle the alloy by a process of second phase precipitation. Second-phase particles were observed only on grain boundaries in the silicon alloys with greater than or equal to 3 at. % Si, but these precipitates were almost silicon free. Copper additions resulted in extensive precipitation throughout the matrix and on grain boundaries except for a precipitate-free zone adjacent to the grain boundaries. Nickel additions also resulted in grain boundary fracture in two-phase alloys except for the alloy of the composition 40 at. % Fe-40Ni-20Al. This alloy improved high-temperature strength as well as room-temperature ductility. DOE

N85-18138# Oak Ridge National Lab., Tenn.

RESISTIVITY OF ALLOYS

W. H. Butler 1984 16 p refs Presented at High-Temp. Alloys: Theory and Design Conf., Bethesda, Md., 8 Apr. 1984

(Contract DE-AC05-84CR-21400)

(DE85-000906; CONF-840417-7) Avail: NTIS HC A02/MF A01

The problem of calculating the electrical resistivity of metals and alloys is briefly reviewed, and a new theory for the transport properties of random alloys is presented. The new theory is based on the Korringa-Kohn-Rostoker Coherent-Potential-Approximation and allows the calculations of the transport coefficients of real alloys from first principles without the need for adjustable parameters. It reduces to the Boltzmann equation when the energy bands are well defined, but it is also applicable when the electronic mean free path is so short that the energy bands can no longer be defined. DOE

N85-18139# Oak Ridge National Lab., Tenn.

SANS AND TEM STUDIES OF CARBIDE PRECIPITATION AND CREEP DAMAGE IN TYPE 304 STAINLESS STEEL

M. H. Yoo, J. C. Ogle, J. H. Schneibel, and R. W. Swindeman 1984 7 p refs Presented at 5th Riso Intern. Symp. on Metallurgy and Materials Sci., Roskilde, Denmark, 1 Sep. 1984

(Contract DE-AC05-84OR-21400)

(DE85-000933; CONF-8409103-3) Avail: NTIS HC A02/MF A01

Small angle neutron scattering (SANS) and transmission electron microscopy (TEM) studies were performed to characterize the carbide (M23C6) precipitation and creep damage induced in type 304 stainless steel in the primary creep stage. The size distribution of matrix carbides evaluated from SANS analyses was consistent with TEM data, and the expected accelerated kinetics of precipitation under applied stress was confirmed. Additional SANS measurements after the postcreep solution annealing were made in order to differentiate cavities from the carbides. Potential advantages and difficulties associated with characterization of creep induced cavitation by the SANS techniques are discussed. DOE

N85-18140# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

EFFECT OF TEMPERING ON THE STRENGTH AND TOUGHNESS OF 2 1/4 Cr-1 Mo STEEL WELDMENTS

R. W. Swindeman, R. K. Nanstad, J. F. King, and W. J. Stelzman Oct. 1984 43 p refs

(Contract DE-AC05-84OR-21400)

(DE85-003818; ORNL/TM-9307) Avail: NTIS HC A03/MF A01

Hardness, tensile, and Charpy V-notch impact tests were performed on samples prepared from submerged arc weldments of 2 1/4 Cr-1 Mo steel. The effect of tempering on the strength and ductility of the alloy was explored to assess the potential for developing a high-strength alloy for gasifier pressure vessel service to 300 C. It is indicated that good weld metal strength and toughness could be achieved. It is concluded that qualification of a quenched-and-tempered version of 2 1/4 Cr-1 Mo steel with ultimate strength in the range 620 to 758 MPa will be difficult for welded gasifier pressure vessels because of a narrow time-temperature tempering window. A minimum ultimate strength requirement of 585 MPa, however, would be much easier to achieve because of the larger window. DOE

N85-18141# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

BEHAVIOR OF PRESSURIZED TUBES OF CANDIDATE ALLOYS IN A SIMULATED LOW-Btu ENVIRONMENT

G. R. Smolik and J. E. Flinn 17 Sep. 1984 15 p refs Presented at the Intern. Symp. on High Temperature Corrosion in Energy Systems, Detroit, 17 Sep. 1984

(Contract DE-AC07-76ID-01570)

(DE85-003403; EGG-M-25783; CONF-840978-4) Avail: NTIS HC A02/MF A01

Tube specimens prepared from four candidate alloys for coal gasifiers were exposed in an environment simulating low-Btu conditions at 815 C. The test environment selected to represent slagging low-Btu gasifiers was generated from a mixture of Ar, H2, H2O, and H2S. Lifetimes of these alloys under pressurization were compared with those observed in air and in other less sulfidizing simulated gasifier environments. The development of oxide/sulfide scales upon the outer surfaces was evaluated. Sulfidation was more severe with exposure to the low-Btu condition compared to exposures in the other environments. The formation of external sulfides were stimulated by strain induced cracks. Incoloy 800H experienced the greatest amount of sulfidation, which led to hot corrosion, i.e., the formation of molten eutectics. This contributed to a reduction in the endurance of this alloy. Although external sulfides developed on the other alloys, particularly at surface cracks, lifetimes were not noticeably affected for test durations of up to 400 h. DOE

N85-18142# Oak Ridge National Lab., Tenn.

ION IMPLANTATION OF SURGICAL Ti-6Al-4V ALLOY

J. M. Williams and R. A. Buchanan Sep. 1984 30 p refs Presented at Intern. Conf. on Surface Modification of Metals by Ion Beams, Heidelberg, F. R. Germany, 17 Sep. 1984

(Contract DE-AC05-84OR-21400)

(DE85-000943; CONF-8409130-2) Avail: NTIS HC A03/MF A01

Ion implantation of N into surgical Ti-6Al-4V alloy dramatically improved the corrosive wear performance of the alloy. Experiments made use of a special apparatus designed to simulate pertinent chemical and mechanical aspects of the sliding interface between the alloy head and the polyethylene cup of an artificial hip joint and, at the same time, provide an electrochemical measure of wear rate. Profilometer measurements and Rutherford backscattering experiments in conjunction with ion implanted markers were also used to assess wear. All evidence points to a marked improvement in wear rate due to the ion implantation treatment. Samples and wear products were analyzed by ion backscattering of He and H ions. A speculative reason for the improvement is discussed. DOE

N85-18143# Oak Ridge National Lab., Tenn.

PHASE FORMATION AND STABILITY IN THE PSEUDOBINARY Ni3Al-Ni3V ALLOY SYSTEM

A. DasGupta, J. A. Horton, and C. T. Liu 1984 20 p refs Presented at High-Temp. Alloys: Theory and Design Conf., Bethesda, Md., 8 Apr. 1984

(Contract DE-AC05-84OR-21400)

(DE85-001117; CONF-840417-2) Avail: NTIS HC A02/MF A01

In order to study the formation of phases and their thermal stability, DSC (differential scanning calorimetry), X-ray diffraction, and optical microscopy were performed simultaneously in the Ni3A;-Ni3V pseudobinary alloy system. For the alloy series

represented by Ni3(Al/sub x/V/sub 100-x/), a tetragonal DO22 phase was found to form for x < 10, and a cubic L12 phase for x < 75 at room temperature. For 10 < x < 75, the DO22 and L12 phases were found to coexist. Contrary to some theoretical expectations, no complex ordered equilibrium phases formed in this alloy system at any intermediate composition between Ni3Al and Ni3V. Measurements of the order-disorder transition temperature, T/sub c/, by DSC, and the associated details of the phase transformations and stability are discussed. DOE

N85-18144# Argonne National Lab., Ill.
ELEVATED TEMPERATURE CREEP BEHAVIOR OF INCONEL ALLOY 625
A. Purohit and W. F. Burke Jul. 1984 6 p ref Presented at the Joint Meeting of the American Nuclear Society and the Atomic Industrial Forum, Washington, D.C., 11 Nov. 1984
(Contract W-31-109-eng-38)
(DE84-015836; CONF-841105-31) Avail: NTIS HC A02/MF A01

Inconel 625 in the solution-annealed condition was selected as the clad material for the fuel and control rod housing assemblies of the Upgraded Transient Reactor Test Facility (TREAT Upgrade or TU). The clad is expected to be subjected to temperatures up to about 1100(0) C. Creep behavior for the temperature range of 800(0) C. to 1100(0) C of Inconel alloy 625, in four distinct heat treated conditions, was experimentally evaluated. DOE

N85-18145# Sandia Labs., Albuquerque, N. Mex.
ION BEAM STUDIES OF HYDROGEN IN METALS
S. M. Myers, W. R. Wampler, F. Besenbacher (Aarhus Univ.), S. L. Robinson, and N. R. Moody 1984 36 p refs Presented at the Intern. Conf. on Surface Modification of Metals by Ion Beams, Heidelberg, 17 Sep. 1984
(Contract DE-AC04-76DP-00789)
(DE84-017422; SAND-84-1052C; CONF-8409130-1) Avail: NTIS HC A03/MF A01

Methods based on ion implantation and nuclear reaction analysis were used to investigate the behavior of hydrogen isotopes in metals. The binding enthalpy of deuterium (D) at irradiation defects, He bubbles, D2 bubbles, and metal-oxide interfaces was measured for Al, Fe, Ni, Cu, Pd, austenitic stainless steel, Inconel, and amorphous Fe40Ni40P14B6. The binding enthalpies determined for the pure metals are in excellent agreement with mechanistic calculations based on effective-medium theory and other information. Surface-limited release of D from Fe, stainless steel, and Inconel was measured as a function of temperature and the state of surface oxidation. The release rate was accurately proportional to the square of the D concentration in solution, permitting the results to be expressed in terms of a surface recombination coefficient. This quantity was up to four orders electropolish oxide. The diffusion coefficient and solid solubility of tritium in stainless steel were measured at the ice point. DOE

N85-18146# Monsanto Research Corp., Miamisburg, Ohio.
CONSOLIDATION OF THERMITES BY PRESSING AND SINTERING
M. D. Kelly and L. D. Abney 1984 11 p refs Presented at the 9th Intern. Protechnics Seminar, Colorado Springs, 6 Aug. 1984
(Contract DE-AC04-76DP-00053)
(DE84-016943; MLM-3182(OP); CONF-840867-5) Avail: NTIS HC A02/MF A01

Consolidated thermites can be used as chemical heat sources. Pressing and sintering, a power metallurgy technique, was developed to consolidate thermite parts with uniform density, composition, and caloric output. These materials are safe to handle, machineable, and generate minimum gas pressure upon reaction. This technique consists of die pressing various compositions of blended thermite powders, then isostatic pressing the parts before sintering to ensure the uniform density of the thermite composites. Parts sintered at various temperatures were examined metallographically for compositional uniformity and to determine whether diffusion between the powders had occurred. Flexure and tensile strength values were obtained to determine the temperature range required to produce strong parts. The coordination of metallography and strength values for various compositions and sintering temperature resulted in data that were used to optimize the fabrication process. Consolidation of thermite by pressing and sintering was found to be a valid process for producing uniform, dense, strong thermite parts. DOE

N85-18147# Brookhaven National Lab., Upton, N. Y.
ELECTRON-IRRADIATED EFFECTS IN METALS
C. L. Snead, Jr. 1984 9 p refs Presented at 16th Natl. SAMPE Tech. Conf. on Materials and Processes, Albuquerque, N. Mex., 9 Oct. 1984
(Contract DE-AC02-76CH-00016)
(DE84-016989; BNL-35131; CONF-841055-3) Avail: NTIS HC A02/MF A01

The study of Frenkel defects in metals is best accomplished using low temperature electron damage as the means of producing well characterized concentrations of defects. Subsequent experimental investigation of the damage using a variety of techniques is discussed. The strengths and the complementary nature of several of these techniques are highlighted by a report on work done using resistivity and internal friction measurements of a Nb3Sn thin film irradiated below 20 K. Results are presented and some tentative conclusions drawn on the possible migration scenarios for the complexity of Nb and Sn interstitials and vacancies produced. DOE

N85-18148# Argonne National Lab., Ill. Materials Science and Technology Div.
SYNERGISTIC SPUTTERING PROPERTIES OF BINARY ALLOYS
A. R. Krauss, A. B. DeWald (Georgia Inst. of Technology), D. M. Gruen, and N. Q. Lam 1984 38 p refs Presented at the Workshop on Synergistic Effects in Surface Phenomena Related to Plasma-wall Interactions, Nagoya, Japan, 21-23 May 1984
(Contract W-31-109-ENG-38)
(DE84-017493; CONF-840534-2) Avail: NTIS HC A03/MF A01

It was found that dilute concentrations of lithium in copper produce surfaces which are nearly pure lithium when heated and subject to irradiation. In order to better understand the experimental results, the Cu-Li system was modeled using a modified version of the TRIM computer code and an alloy segregation program developed by N.Q. Lam. The TRIM code calculates the sputtering yield and depth of origin of the sputtered atoms for materials in which the composition varies from one atomic layer to the next and the segregation program uses these sputtering yields to trace the evolution of the concentration profile. The initial result of sputtering is to preferentially deplete the surface species. Continued irradiation, however, creates a subsurface region of high displacement damage. In the Cu-Li alloy, lithium moves very rapidly through this region, resulting in subsurface lithium enrichment. The enriched region broadens and eventually reaches the surface. The exact effect on the lithium concentration in the first two atomic layers depends on the temperature, damage profile, and particle flux. Implications for fusion reactor materials are discussed. DOE

N85-18149# Rolls-Royce Ltd., Derby (England).
ADAPTATION OF REMELTING PROCEDURES FOR THE USE OF RECYCLED METAL IN NICKEL-BASE SUPERALLOY CASTINGS
Y. Bienvenue (Ecole Nationale Superieure des Mines, Paris), D. Ablitzer (Ecole Nationale Superieure de la Metallurgie et de l'Industrie des Mines), G. Lesoult (Ecole Nationale Superieure de la Metallurgie et de l'Industrie des Mines), and J. Driole 9 Nov. 1984 9 p refs Transl. into ENGLISH of French Doc. Rept. Trans-16568/TLT-00916A
(PNR-90232; Trans-16568/TLT-00916A) Avail: NTIS HC A02/MF A01

A research project on changes induced by recycling in the solidification of nickel-base superalloys is proposed. The influence of the accumulation of the metalloids, nitrogen and oxygen is to be defined and interpreted from thermodynamic data. Obtaining the thermodynamic data will result in a better understanding of solidification and greater mastery of the working of nickel-base

refractory alloys. It will allow processes to be formulated to facilitate the recycling of such alloys by keeping changes in composition to a minimum and adapting remelting so as to promote the removal of metalloids will also be made possible. Author (ESA)

N85-18150# Bureau of Mines, Albany, Oreg.
Ti-6Al-4V ALLOY CASTINGS PREPARED IN ZIRCON SAND MOLDS AND THE EFFECT OF HOT ISOSTATIC PRESSING
J. I. Paige, P. G. Clites, and J. L. Henry 1984 23 p refs
(PB85-109932/GAR; BM-RI-8897; LC-84-600139) Avail: NTIS HC A02/MF A01 CSCL 11F

The Bureau of Mines conducted studies to provide data on the room temperature mechanical properties of Ti-6Al-4V alloy cast in waterglass-bonded zircon sand and to determine the effect of hot isostatic pressing (HIP) on these properties. Data on the cast and annealed Ti-6Al-4V alloy were compared with published data for forged and investment-cast Ti-6Al-4V alloy. GRA

N85-18151# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
STOCHASTIC MODELS OF PITTING CORROSION OF STAINLESS STEELS. PART 1: MODELLING OF THE INITIATION AND GROWTH OF PITS AT CONSTANT POTENTIAL
D. E. Williams, C. Westcott, and M. Fleischmann Jun. 1984 45 p refs
(AERE-R-11146-Pt-1) Avail: NTIS HC A03/MF A01

A stochastic model for pit initiation is developed, involving as parameters an initiation frequency for pit nuclei, a death probability for unstable pits and a critical age which defines the transition between a stable and an unstable pit. Emphasis is placed on validating methods for data analysis to recover the parameters of the model from observed current-time series. Such methods are developed and tested using data generated by computer simulation of the process. The expected induction time for stable pit initiation is derived. Results for the statistics of ensembles of current-time transients are given. Methods of analysis of the spectral power density of the current, taking into account the nonstationary process of stable pit propagation, are considered. Author

N85-18221# Joint Publications Research Service, Arlington, Va.
ANTIFRICTION NICKEL-PHOSPHOROUS COATINGS ON ALUMINUM ALLOY PRODUCTS Abstract Only
V. I. Latutuyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 32 Transl. into ENGLISH from Vestn. Mashinostr. (Moscow), no. 2, Feb. 1984 p 71 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-18152 Lehigh Univ., Bethlehem, Pa.
APPLICABILITY OF LINEAR ELASTIC FRACTURE MECHANICS TO FATIGUE IN POLYMERS AND SHORT-FIBER COMPOSITES Ph.D. Thesis
Reinhold Walter Lang 1984 272 p
Avail: Univ. Microfilms Order No. DA8418421

The potential contributions of the path or history dependence of mechanical properties below yielding, viscoelastic nonlinearity, and hysteretic specimen heating on the macroscopic fatigue crack propagation (FCP) response in several polymeric solids are examined and evaluated in terms of their compatibility with concepts of linear elastic fracture mechanics (LEFM). In good agreement with LEFM principles, the FCP response of poly (methylmethacrylate) (PMMA) and polycarbonate (PC) was found to be independent of specimen geometry and configuration. These results provide evidence that far-field memory effects have no influence on the macroscopic FCP resistance in these materials so long as the overall stress conditions on a specimen remain within the range of linear viscoelasticity. In sharp contrast, experiments on nylon 66 (4.7% water) involving different specimen configurations and test frequencies revealed that nonlinear viscoelasticity and hysteretic heating on a larger scale violate basic assumptions of LEFM so that macroscopic crack growth rates are no longer uniquely related to Delta Kappa. Dissert. Abstr.

N85-18153*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGICAL PROPERTIES OF GRAPHITE-FIBER-REINFORCED, PARTIALLY FLUORINATED POLYIMIDE COMPOSITES
Robert L. Fusaro and William F. Hady 1985 28 p refs Proposed for presentation at the Ann. Meeting of the American Society of Lubrication Engineers, Las Vegas, Nev., 6-9 May 1985
(NASA-TM-86926; E-2422; NAS 1.15:86926) Avail: NTIS HC A03/MF A01 CSCL 11G

Graphite-fiber-reinforced polyimide (GFRPI) composites were formulated from three new partially fluorinated polyimides and three types of graphite fiber. Nine composites were molded into pins and evaluated in a pin-on-disk tribometer. Friction coefficients, wear rates, pin wear surface morphology, and transfer film formation were assessed at 25 and 300 C. Also assessed was the effect of sliding speed on friction. Wear was up to two orders of magnitude lower at 25 C and up to one order of magnitude lower at 300 C than with previously formulated NASA GFRPI composites. Author

N85-18154*# General Motors Corp., Indianapolis, Ind.
AN INVESTIGATION OF ENHANCED CAPABILITY THERMAL BARRIER COATING SYSTEMS FOR DIESEL ENGINE COMPONENTS Final Report
Robert L. Holtzman, Jerry L. Layne, and Berton Schechter Aug. 1984 140 p refs
(Contracts DEN3-326; DE-AI01-80CS-50194)
(NASA-CR-174820; DOE/NASA/0326-1; NAS 1.26:174820; EDR-11869) Avail: NTIS HC A07/MF A01 CSCL 11B

Material systems and processes for the development of effective and durable thermal barriers for heavy duty diesel engines were investigated. Seven coating systems were evaluated for thermal conductivity, erosion resistance, corrosion/oxidation resistance, and thermal shock resistance. An advanced coating system based on plasma sprayed particle yttria stabilized zirconia (PS/HYSZ) was judged superior in these tests. The measured thermal conductivity of the selected coating was 0.893 W/m C at 371 C. The PS/HYSZ coating system was applied to the piston crown, fire deck and valves of a single cylinder low heat rejection diesel engine. The coated engine components were tested for 24 hr at power levels from 0.83 MPa to 1.17 MPa brake mean effective pressure. The component coatings survived the engine tests with a minimum of distress. The measured fire deck temperatures decreased 86 C (155 F) on the intake side and 42 C (75 F) on the exhaust side with the coating applied. M.G.

N85-18155# Oak Ridge National Lab., Tenn.
FABRICATION OF CERAMIC-CERAMIC COMPOSITES BY CHEMICAL VAPOR DEPOSITION
D. P. Stinton, W. J. Lackey, R. J. Lauf, and T. M. Besmann 1984 19 p refs Presented at the Conf. on Composites and Advan. Ceram. Mater., Cocoa Beach, Fla., 16 Jan. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000981; CONF-840171-1) Avail: NTIS HC A02/MF A01

Toughened ceramic composites were produced by the simultaneous chemical vapor deposition of two phases. Fracture toughness values were nearly double the value of SiC when CH3SiCl3 and TiCl4 vapors were used to produce SiC-TiSi2 composites. Other systems consisting of SiC and the metal or metal carbides of Ni, Cr, W, and Mo were examined. Equilibrium thermodynamic analyses of these systems were performed as a function of the chemical vapor deposition variables: temperature, total pressure, and reactant concentration. These calculations confirmed that the volatile species used early in this work (organometallic compounds of Ni and Cr and the fluorides of W and Mo) were not suitable for the production of toughened composites. Thermodynamic calcula-

tions also indicated that SiC and TiC should be codeposited when CH3SiCl3, TiCl4, and a hydrocarbon are used as the coating gases. DOE

N85-18156# Purdue Univ., Lafayette, Ind. School of Nuclear Engineering.
MECHANISMS OF ELEVATED TEMPERATURE RUPTURE IN SINGLE PHASE CERAMICS Progress Report, 1 Feb. 1984 - 31 Jan. 1985
A. A. Solomon Sep. 1984 154 p refs
(Contract DE-AC02-80ER-10591)
(DE85-000697; DOE/ER-10591/T3; COO-10591-5) Avail: NTIS HC A08/MF A01

Research is reported on the following topics: effects of microstructural variations on pore growth, swelling and pore growth in UO2, tensile creep of CoO scales, tensile creep of sintered UO2, and effect of internal gas pressure in porosity and grain size evolution. DOE

N85-18157# National Academy of Sciences - National Research Council, Washington, D. C. Committee on the Status of High Technology Ceramics in Japan.
HIGH-TECHNOLOGY CERAMICS IN JAPAN
1984 70 p refs
(TI85-900389; NMAB-418) Avail: NTIS HC A04/MF A01

Japan is widely viewed as having a significant national commitment to developing and exploiting high technology ceramics in order to advance its domestic and international markets. This situation contrasts markedly with that in the United States, where such an intensive effort has not been mounted. The findings of a committee formed to assess the situation in Japan are presented. The assessment was carried out in order to provide an understanding of the possible effects on high technology ceramics in the United States and to establish a basis for possible future cooperation in ceramics science and technology between Japan and the United States. The committee concluded that there is, indeed, a strong commitment in Japan to the rapid development and exploitation of high technology ceramics. The greatest potential for application of this technology appears to be in the automobile and electronics industry. Cooperation between Japan and the United States would be feasible and welcome. R.S.F.

N85-18158# Sandia Labs., Albuquerque, N. Mex.
CVD BORON ON CALCIUM CHROMATE POWDER
R. M. Coonen Sep. 1984 27 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000214; SAND-84-0260) Avail: NTIS HC A03/MF A01

This study was an experimental effort to improve the compositional homogeneity of a pyrotechnic mixture of boron and calcium chromate (CaCrO4). Boron was deposited onto calcium chromate powders at 350 C from a diborane and hydrogen gas mixture at a pressure of 40 torr by Chemical Vapor Deposition (CVD). The B:CaCrO4 ratio of the coated powders was analyzed by inductively-coupled plasma spectroscopy and the distribution of the two phases was observed by electron microprobe analysis. The pyrotechnic activity was determined by differential thermal analysis. In addition to varying the composition of the mixture, an attempt was made to vary the boron distribution by coating both sized and unsized CaCrO4 powders. Boron was deposited for 2 h onto sized CaCrO4 powder, which resulted in a higher weight percentage of boron in comparison to the unsized powder. CVD coated CaCrO4 powders began their pyrotechnic activity at an auto ignition temperature that was lower than the auto ignition temperature observed for mechanically blended mixtures. The coating of sized CaCrO4 powder improved the uniformity of boron deposition of CaCrO4, but it also decreased the pyrotechnic activity. DOE

N85-18159# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
EFFECT OF ULTRAVIOLET RADIATION ON TRANSPARENT POLYMER FILMS AS DETERMINED USING IN SITU FTIR-RA SPECTROSCOPY. VOLUME 2: PHOTOPHYSICS OF POLY (VINYLIDENE FLUORIDE) FILMS
John D. Webb Aug. 1984 23 p refs 2 Vol.
(Contract DE-AC02-83CH-10093)
(DE84-013040; SERI/TR-255-2177-VOL-2) Avail: NTIS HC A02/MF A01

The application of Fourier transform infrared reflection absorption (FTIR-RA) spectroscopy to the in situ study of the effects of ultraviolet radiation on polymeric materials proposed for use in passive solar heating and cooling systems is demonstrated. The method permits collection of the infrared reflection absorption spectrum of a polymer film on an IR reflective substrate while the sample is exposed to simulated outdoor-conditions. Evidence for photophysical changes resulting from exposure of poly(vinylidene fluoride) films to ultraviolet radiation is presented. DOE

N85-18160# California Inst. of Tech., Pasadena. Lab. of Engineering Materials.
ELECTRICAL RESISTIVITY AND STRUCTURAL CHANGES UPON RELAXATION AND CRYSTALLIZATION OF (Mo/SUB 0.6/Ru/SUB 0.4)SUB 100-x/B/SUB x/ METALLIC GLASSES
R. Schulz, M. Mehra, and W. L. Johnson Jun. 1984 30 p refs
(Contract DE-AT03-81ER-10870)
(DE84-017281; DOE/ER-10870/150) Avail: NTIS HC A03/MF A01

Crystallization of Mo sub 0.6/Ru sub 0.4 sub 100-x/B sub x glasses takes place in three steps. The first step, corresponds to the precipitation of the sigma phase Mo5Ru3 which decomposes at higher temperatures. The second step is associated with the formation of an hcp solid solution of Mo in Ru, and in the last step the remaining amorphous matrix crystallize in an fcc boride. Detailed electrical resistivity measurements taken below the crystallization temperature reveal an excess resistivity above the usual linear temperature dependence predicted by the Ziman theory. The increase in resistivity is associated with the onset of long range compositional inhomogeneity (spinodal decomposition) and the decrease with the beginning of crystallization. The electrical behavior for samples preannealed for 12 hours at various temperatures suggest that boron migration is partly responsible for this excess resistivity. The linear relationship between the conductivity and the electronic density of states across the concentration range, and the fact that upon annealing Mo sub 0.6/Ru sub 0.4 82B18 the maximum in the excess resistivity is associated with a minimum in the density of states, indicates that Mott's model is not applicable and suggests that the d electrons are important in the conduction. DOE

N85-18161# Argonne National Lab., Ill. Materials Science and Technology Div.
CORROSION OF CERAMICS IN HEAT EXCHANGER APPLICATIONS
T. E. Easler and R. B. Poeppel Aug. 1984 13 p refs Presented at the Intern. Symp. on High Temp. Corrosion in Energy Systems, Detroit, 17 Sep. 1984
(Contract W-31-109-ENG-38)
(DE84-017459; CONF-840978-3) Avail: NTIS HC A02/MF A01

The corrosion behavior of several structural ceramic materials was evaluated under laboratory controlled conditions as a step in assessing their compatibility with a coal gasification environment. Application of these materials in heat recovery systems is of interest. Several variables including material composition, exposure temperature, and the presence or absence of a coal slag coating were investigated. The results indicate that the silicon carbide ceramic materials included in this study perform very well in the absence of fused coal slag. The presence of molten slag at high temperature, however, resulted in some material degradation via surface reaction and penetration. DOE

N85-18162# Sandia Labs., Albuquerque, N. Mex. Inorganic Materials Chemistry Div.
GLASS CORROSION IN LIQUID LITHIUM
Douglas R. Salmi and Bruce C. Bunker Sep. 1984 20 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002086; SAND-83-2314) Avail: NTIS HC A02/MF A01

Several families of glass compositions were corroded in liquid

lithium at 250 C to evaluate their chemical durability for applications in ambient-temperature lithium batteries. Silicate glasses were found to be the least durable, followed by aluminoborate and lithium borate glasses. Calcium aluminate and phosphate glasses did not appear to be corroded by liquid lithium. Although some of the observed trends in chemical durability could be explained on the basis of thermodynamics, other factors, such as the variability of sample wetting by liquid lithium, also appear to control reaction kinetics. In general, glass corrodes 100,000 times faster in 250 C liquid lithium than in simulated ambient-temperature lithium battery tests, making the liquid lithium test convenient as an accelerated screening test for battery applications. DOE

N85-18163# Clark Coll., Atlanta, Ga. Dept. of Physics.
STUDY OF CHARGE TRANSPORT IN THE THERMOELECTRET STATE OF SOME CERAMICS AND GLASSES Progress Report, 1 Jul. 1983 - May 1984
O. P. Puri 1984 4 p
(Contract DE-AS05-83ER-45046)
(DE85-001763; DOE/ER-45046/T1) Avail: NTIS HC A02/MF A01

The goal is to investigate the mechanism and decay of electrets in nonpolar inorganic polycrystalline and amorphous dielectrics. Experiments were performed to develop electrets, measure charge, and collect data on these decays. Zirconia was used. DOE

N85-18164# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
STUDY OF THE MECHANISM FOR ANNEALING EMBRITTLEMENT OF AN IRON-BASED METALLIC GLASS
D. M. Kroeger, C. C. Koch (North Carolina State Univ., Raleigh), C. G. McKamey, J. O. Scarbrough, and R. A. Padgett 1984 4 p refs Presented at the 5th Intern. Conf. on Rapidly-quenced Metals, Wurzburg, West Germany, 3 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE84-016856; CONF-8409107-5) Avail: NTIS HC A02/MF A01

Fracture surface of annealed and embrittled Fe8OB16Si2C2 melt spun ribbons were examined by Auger electron spectroscopy. Evidence was found that inhomogeneous distributions of oxygen and of alloy constituents may be involved in embrittlement. It was found that microadditions of cerium to the alloy decreased the rate of embrittlement. DOE

N85-18165# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
CERAMIC FABRIC MATERIAL TESTING Interim Report
R. Chang 29 Jun. 1984 111 p refs
(Contract DE-AC21-83MC-20110)
(DE84-012014; DOE/MC-20110/1636) Avail: NTIS HC A06/MF A01

The objective of this R and D project is to provide rapid testing procedures and associated apparatus that can be used to quantitatively assess appropriate properties of ceramic fabrics. These rapid tests are needed to evaluate ceramic fabric for their potential as bag filter media for hot gas cleanup, comparing various ceramic fabrics in terms of selected performance properties, and ensuring uniformity of the ceramic fabric during the manufacturing process. Contents of this report include the following: (1) program summary; (2) characterizing and specifying filter fabrics; (3) evaluating ceramic filter media potential; (4) preliminary plan for characterization and evaluation of ceramic filter media candidates; and (5) appendices for textile terminology and description of specifications and test procedures. DOE

N85-18166# Texas Technological Univ., Lubbock. Glass Research and Testing Lab.
EVALUATION OF LATERALLY LOADED LAMINATED GLASS UNITS BY THEORY AND EXPERIMENT Final Report
Magnus P. Linden, Joseph E. Minor, and C. V. G. Vallabhan Jul. 1984 67 p Sponsored in part by Monsanto Plastics and Resins Co.
(PB85-111532/GAR; IDR/DOC-72D; SR-1) Avail: NTIS HC A04/MF A01 CSCL 11B

The effects of long term loading and different interlayer thickness were studied for glass plates with different geometries. The failure strength of laminated glass units and monolithic units of comparable glass thickness and geometry was compared. GRA

N85-18167# Textron Bell Aerospace Co., Buffalo, N. Y.
CAVITATION EROSION RESISTANT COATINGS FOR PUMPS Final Report, Sep. 1977 - Jan. 1984
Ivan C. Snell and Paul K. Conn Jun. 1984 145 p refs
(Contract MA-7-38044)
(PB85-120210/GAR; MA/RD-760-84035) Avail: NTIS HC A07/MF A01 CSCL 13K

The results of an investigation to develop/identify cavitation erosion resistant covering systems for water pumps and pump components, and the satisfactory adhesive bonding of such systems are discussed. The investigation included the evaluation of coatings for hydrolytic stability, cavitation erosion resistance and suitability for application to components of complex configuration. Also included were the evaluation of a number of primers/adhesives and adhesion promoters for hydrolytic stability and the effect of protracted environmental exposure upon coatings-primer/adhesive-substrate bond strength and integrity. A methodology is described for the application of primers/adhesives and pore free coverings to components of complex configuration. GRA

N85-18225# Joint Publications Research Service, Arlington, Va.
FRG FIRMS JUMP INTO MARKET FOR AUTO, AIRCRAFT CERAMICS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 1-3 Transl. into ENGLISH from Industriemag. (Munich), 15 Oct. 1984 p 97; 100 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

N85-18226# Joint Publications Research Service, Arlington, Va.
FRG RADIOTELESCOPE MADE OF CARBON FIBER-REINFORCED PLASTIC
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 4 Transl. into ENGLISH from Produktion (West Germany), 30 Aug. 1984 p 2 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-18168 Georgia Inst. of Tech., Atlanta.
INVESTIGATION OF THE PRESSURE-AND VELOCITY-COUPLED RESPONSES OF SOLID PROPELLANTS USING IMPEDANCE TUBE METHOD Ph.D. Thesis
Lakashmanan Lalgudi Narayanaswami 1984 213 p
Avail: Univ. Microfilms Order No. DA8425189

Two impedance tube setups used to utilize and investigate the pressure-coupled response and the velocity-coupled response of solid propellant are described. The pressure-coupled response function of the propellant sample and the gas phase losses were measured as well as the effect of aluminum addition to solid propellants on combustion instability. It was found that aluminum addition increased both the propellant pressure-coupled response function and the gas phase losses. The validity of current approaches which use the so-called velocity-coupled response function to determine the stability of rocket motors was assessed using test propellant samples at different locations along the standing acoustic wave in the impedance tube. The measured value of the velocity-coupled response function was different at these different locations. These results indicate that the velocity-coupled response function exhibited by a propellant is likely to be

different at different acoustic environments and, consequently, cannot be considered a propellant property. Dissert. Abstr.

N85-18169 Southampton Univ. (England). Dept. of Electrical Engineering.
EVALUATION OF MINIMUM IGNITION ENERGY MEASUREMENT TECHNIQUES USED AT P.E.R.M.E.
25 Jan. 1984 54 p refs
(Contract PERME-D/RME-1/11/638)
(SG83/A258; BR92038) Avail: Issuing Activity

Mechanisms involved in the formation of electrical discharges and the onset of ignition were reviewed. Recommendations towards the improvement of methods used to determine minimum ignition energies are made. The relevance of these methods with regard to electrostatic hazards in general is discussed. Author (ESA)

N85-18170# RAND Corp., Santa Monica, Calif.
THE INFRASTRUCTURE FOR A SURGE IN SYNFUELS PRODUCTION: THE POTENTIAL ROLE OF THE AE AND C INDUSTRY AND OF OWNER OPERATORS
Leland L. Johnson and Christopher Worthing Jul. 1984 106 p refs Sponsored by US Synthetic Fuels Corp.
(Rand/N-2172-SFC) Avail: NTIS HC A06/MF A01

The degree to which the architectural, engineering, and construction (AE&C) industry and potential owner-operators have, or can obtain, the human and organizational resources to support rapid development of a commercial synfuels program was studied. The focal points of the investigation were: (1) the initial or first-round capability to design and build simultaneously numerous plants of commercial size; (2) the second-round capability of the industry, drawing from first-round experience; (3) the ways in which capabilities could be expanded; (4) the rapidity with which capabilities built up from experience with early commercial synfuels plants would atrophy if a pause were to occur in the construction of follow-on synfuels plants; and (5) the speed with which these capabilities would be recovered if, after a delay, additional plants were built. R.S.F.

N85-18171# Chem Systems, Inc., Tarrytown, N.Y.
LIQUID PHASE METHANOL PROCESS DEVELOPMENT UNIT: INSTALLATION, OPERATION, AND SUPPORT STUDIES Technical Progress Report, 1 Apr. - 30 Jun. 1984
20 Jul. 1984 88 p refs
(Contract DE-AC22-81PC-30019)
(DE85-001311; DOE/PC-30019/T13; TPR-11) Avail: NTIS HC A05/MF A01

This quarter's activity was highlighted by the successful operation of the LaPorte PDU during the 40-day activity maintenance run using the EPJ-19LR (United Catalysts, Inc.) catalyst (Task 6) and during a 6-day run using a BASF catalyst (Task 10). As with the LaPorte PDU shakedown run during the last quarter, the pelletized catalyst rapidly attrited to a fine powder slurry. Nonetheless, the catalyst remained highly active with a methanol production rate reaching as high as 8 tpd. Operation was smooth and the post-run inspection showed that the plant was in good condition, free of blockages or large deposits. However, about 20% of the original catalyst charged had deposited as film on vessel walls or in dead spaces. Methanol production decreased from an initial 5 tpd to a final 2.5 tpd. The 40-day run produced 165 tons (50,000 gal) of methanol. Valuable information catalyst activity maintenance and properties was obtained. Analysis of catalyst samples revealed the slow but steady buildup of iron and nickel on the catalyst. The mechanical performance of the LaPorte PDU during the 40-day run was excellent. With almost 1000 hours of slurry operation, there were no signs of erosion of the slurry pump or piping. DOE

N85-18172# Los Alamos Scientific Lab., N. Mex.
EVALUATION OF THE FUNDAMENTAL RESEARCH ON EXPLOSIVES (FRE) PROGRAM
T. Rivera and R. L. Rabie Sep. 1984 20 p
(Contract W-7405-eng-36)
(DE85-001537; LA-10152-MS) Avail: NTIS HC A02/MF A01

A means to quantify both progress and the relative importance of the various tasks composing a large research program is discussed. The discussion is within the context of the particular example of the Fundamental Research on Explosives (FRE) program currently at the Los Alamos National Laboratory. The analysis reveals a strong connection in the generally parallel layout of the FRE program to planning for crisis aversion. The analysis is found to be valuable in obtaining a view of an existing R and D program in terms of its current probability of meeting its goals. DOE

N85-18173# California Univ., Livermore. Lawrence Livermore Lab.
LX-10 AND LX-17 MOISTURE CONTENT AND RELEASE
L. P. Rigdon, D. L. Seaton, and A. J. Pane 17 Aug. 1984 12 p refs
(Contract W-7405-eng-48)
(DE84-016579; UCRL-53533) Avail: NTIS HC A02/MF A01

The results of four studies related to the moisture content, uptake, and release by two plastic bonded explosives are reported. Formulations designated LX-10 and LX-17 were studied and are 95% HMX + 5% Viton A and 92.5% TATB + 7.5% Kel-F 800, respectively. Moisture content profiles for LX-17 following accelerated aging studies were obtained by analyzing dry machinings of pressed billets. These data are compared to the total hydrogen produced by materials test units containing pressed LX-17. Moisture released by pressed billets in closed containers was measured indirectly by measuring the amount of H2 produced, as released water reacted with uranium to produce UO2 and H2. The LX-10 and LX-17 billets were subjected to temperature variations involving thermocycling between -54(0)C and 74(0)C and isothermal aging for periods of 3 to 14 months. Two LX-17 billets were soaked in water for 16 hours, air dried, and retested for moisture. Moisture is very slowly taken up and released by pressed, plastic bonded explosives in diffusion controlled processes. Several hours of wet machining the parts will not result in a significant moisture content increase. DOE

N85-18174# Sandia Labs., Albuquerque, N. Mex.
ANALYSIS OF A POTENTIAL HOT-WIRE IGNITION PROBLEM
M. L. Lieberman, F. J. Villa, and C. J. North 1984 18 p refs Presented at 12th Symp. on Explosives and Pyrotechnics, San Diego, Calif., 13 Mar. 1984
(Contract DE-AC04-76DP-00789)
(DE84-017254; SAND-83-1894C; CONF-840383-5) Avail: NTIS HC A02/MF A01

A potential ignition problem in a hot wire device was identified from bridgewire resistance measurements. Microscopic evaluation showed bridgewire deformation which led to the proposal of several potential failure modes. Experimental and analytical assessment of the proposed failure modes implied each was unlikely. Processing studies established that reliable ignition was not jeopardized by small process changes. Extensive lot testing verified that reliable ignition was not jeopardized by the bridgewire deformation. DOE

N85-18175# Santa Clara Univ., Calif.
RESEARCH AND DEVELOPMENT OF ALCOHOL FUEL USAGE IN SPARK IGNITED ENGINES Monthly Progress Report, Aug. 1984
Aug. 1984 5 p refs
(Contract DE-FG03-84CE-50036)
Avail: NTIS HC A02/MF A01

Progress is reported on the following: computer modeling of cold starting, cold start droplet preparation studies, dissociated methanol for cold starting, corrosion and wear study, smog chamber experiments and aldehyde measurements, and Toyota Cressida tests. DOE

N85-18176# Monsanto Research Corp., Miamisburg, Ohio.
PARAMETERS AFFECTING HOT WIRE IGNITION OF THERMITE MIXTURES
A. C. Munger and M. D. Kelly 1984 10 p refs Presented at the 9th Intern. Protech. Seminar, Colorado Springs, 6 Aug. 1984

(Contract DE-AC04-76DP-00053)
(DE84-016941; MLM-3181(OP); CONF-840867-8) Avail: NTIS HC A02/MF A01

Ignitors were fabricated using pyrotechnics or explosives that are sensitive to hot wire ignition. Most of these devices have a 1-(UC OMEGA) bridgewire and require 30 to 50 mJ of energy to function when delivered at a 3 to 5 A rate. The use of thermite mixtures was established as thermal output charges in previous work. The components were simplified by using fewer chemical reactions to make the transition from the hot wire stimuli to the rapid burning of highly consolidated thermite mixtures. A second consideration is that the component should contain electrostatic discharge safe materials. Experiments were conducted using a fine particle size - approximately 1-(MU)m constituents in Al/Fe2O3 thermite blends consolidated to 1.8 g/cm(3). The results of the tests show that, by using finely divided materials, sustained ignition can be obtained using a 3.5 A fire pulse into a 1-(UC OMEGA) Tophet C bridgewire. Using the same thermite for the ignition charge, booster charge, and the high density output reduces the number of constituents in the component, and so simplifies the problem of long term compatibility. The potential for reactions is greatly reduced by using an oxidizer that is inherently stable. DOE

N85-18177# Monsanto Research Corp., Miamisburg, Ohio.
STUDY OF BRIDGEWIRE SIZE AND PYROTECHNIC DENSITY RELATIONSHIPS ON ALL-FIRE LEVELS
S. M. Hegedus and A. C. Munger 1984 16 p refs Presented at 9th Intern. Protechnics Seminar, Colorado Springs, 6 Aug. 1984
(Contract DE-AC04-76DP-00053)
(DE84-016946; MLM-3184(OP)) Avail: NTIS HC A02/MF A01

The effects of bridgewire size and pyrotechnic density on the characteristics of a hot wire test device were evaluated. These characteristics were examined before and during initiation. Five bridgewire diameters and two loading densities were examined. Groups of hot wire devices of each bridgewire and density combination were fabricated. After final assembly, electrochemical response data were obtained on each test device, and normalizing technique was introduced so that all groups of test devices could be compared. Then, each group of devices was subjected to a Langlie all-fire test to determine the threshold initiation current for each configuration. The results obtained reveal important boundary conditions and limiting factors related to the functioning characteristics of hot-wire devices. This information may be used to develop improved techniques of hot-wire device design such as computer modeling. Further study in this area would be valuable and is warranted. DOE

N85-18178# Monsanto Research Corp., Miamisburg, Ohio.
DEVELOPMENT OF A PETN DDT DETONATOR
Aug. 1984 8 p refs Presented at 9th Intern. Protechnics Seminar, Colorado Springs, 6 Aug. 1984
(Contract DE-AC04-76DP-00053)
(DE84-016944; MLM-3186(OP); CONF-840867-9) Avail: NTIS HC A02/MF A01

A hot wire initiated deflagration-to-detonation transition (DDT) device using PETN is discussed. The design of the all-PETN explosive train is described. The mean all-fire current was found to be 2.04 A for a 200 msec constant current pulse at -54 C. A mean no-fire current of 1.03 A was obtained at 74 C using a 5 min pulse. A cut-back test was conducted to establish the minimum transition column length required. Reliable DDT was obtained with 5 mm long transition columns using a 2 mm diameter. The capability of the detonator to initiate XTX-8004 was demonstrated. DOE

N85-18179# Northern States Power Co., Minneapolis, Minn.
NATURAL GAS THE NEW LOCOMOTIVE FUEL
Lee W. Tuskey 1984 29 p refs Presented at the Nonpetroleum Vehicular Fuels IV Symp., Arlington, Va., 16 Apr. 1984
(DE84-901824; CONF-840470-1) Avail: NTIS HC A03/MF A01

This is a report on modification of a locomotive diesel engine to a dual-fuel engine to determine if the dual fuel engine in railway service will provide high performance, lower fuel and maintenance costs. After the locomotive was modified and the new governor and linkage were installed by General Motors at the BN's Northtown Diesel Shop near Minneapolis, the locomotive went through startup procedures. General Motors participated in startup. Some calibration, adjustments and minor piping changes were required but in general the problems encountered in startups were quite insignificant. The locomotive was connected to the load box (static test) during startup and at 720 RPM exceeded the required output for this test as established by the parties. Operation on straight oil over the range from idle through No. 8 throttle notch and on dual fuel from No. 5 through No. 8 throttle notch was smooth as was the transfer from oil to gas and from gas to oil. The engine exhaust on straight oil was almost clear but on gas it was totally clear. DOE

N85-18180# Unidynamics/St. Louis, Mo.
CP DDT DETONATORS. PART 1: DESIGN SENSITIVITY STUDY
W. Fleming, J. W. Fronabarger, and M. L. Lieberman (Sandia National Lab., Albuquerque, New Mex.) 1984 26 p refs Presented at the 12th Symp. on Explosives and Pyrotechnics, San Diego, Calif., 13 Mar. 1984
(Contract DE-AC04-76DP-00789)
(DE84-017255; SAND-83-1892C; CONF-840383-4) Avail: NTIS HC A03/MF A01

A standard CP detonator design was used to study a variety of design parameters including test temperature, closure disk thickness, powder column diameter, transition column diameter, powder column confinement, igniter charge holder material, bridgewire diameter, fire pulse energy, fire pulse duration and fire pulse current. The data indicated a minimum function time for such detonators of approximately 7 (MU)s, which is limited by the deflagration-to-detonation (DDT) process. DDT can be achieved in the presence of some venting but is inhibited by charge holder materials which provide the poor confinement. Increasing the powder column diameter or the transition column diameter results in longer function times. With increasing temperature, output increases and function time decreases. DOE

N85-18181# Environmental Protection Agency, Ann Arbor, Mich. Technical Support Staff.
METHANOL VAPORIZATION: EFFECTS ON VOLUMETRIC EFFICIENCY AND ON DETERMINATION OF OPTIMUM FUEL DELIVERY SYSTEM
William B. Clemmens Aug. 1984 82 p refs
(PB84-243914; EPA-AA-TSS-83-9) Avail: NTIS HC A05/MF A01 CSCL 21D

Whether methanol injected into the upstream air passages (additionally to the normal port injection) can cool the inlet air sufficiently through vaporization to increase the volumetric efficiency, and whether the expected increase in volumetric efficiency translate into improved thermal efficiency were investigated. This hypothesis is derived from the mathematical equation of volumetric efficiency in which the efficiency is proportional to the mass of air per unit of time flowing through the engine relative to the swept volume of the engine during that time. Vaporization (through fumigation) in the inlet air should cause a temperature drop of the air, which would increase density and mass flow. To test this hypothesis, two methods of fumigation were tested, both occurring along with the normal port injection of the Nissan 2.0 litre NAPS-Z engine. Neither method improved volumetric or thermal efficiency. In fact, the normal port injection without fumigation gave slightly better results. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-18182# Yamaguchi Univ. (Japan). Faculty of Engineering.
TECHNOLOGY REPORTS OF THE YAMAGUCHI UNIVERSITY,

VOLUME 3, NO. 3
Dec. 1984 73 p refs
(ISSN-0386-3433) Avail: NTIS HC A04/MF A01

Carbide inserts for premature fractures; reactive mufflers; flocculation; seismic earth pressure of cohesive backfill; creep deformation of granite soils; open channel flow; and fast electron performance of hydrogen ion sources are discussed. For individual titles, see N85-18183 through N85-18189.

N85-18183# Yamaguchi Univ. (Japan). Dept. of Applied Mechanical Engineering.
METHOD OF TESTING CARBIDE INSERTS FOR PREMATURE FRACTURE BY FACE MILLING OF CYLINDRICAL WORK-PIECES
Ryozo Kitagawa, Tadahisa Akasawa (Nippon Steel Corp.), and Kitao Okusa *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 193-203 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

Methods are proposed for face milling solid cylindrical workpieces or half-cut and hollow cylindrical workpieces prepared from rectangular blocks by continuously changing both or either of the angles of engagement and disengagement. Carbide inserts are tested for premature fracture before the onset of steady wear using these face-milling methods. The premature fracture indicates the insufficient toughness of carbides to perform a given machining job. As carbides of higher wear resistance have lower shock resistance in general, they must be tested for premature fracture due to the lack of toughness to select suitable carbides for specific cutting applications. The test results obtained under the present study show that the premature fracture of carbides, whose toughness was classified by static toughness tests, can be evaluated dynamically and easily by the proposed face-milling methods. Author

N85-18184# Yamaguchi Univ. (Japan). Dept. of Mechanical Engineering.
STUDIES ON REACTIVE MUFFLERS. PART 2: MUFFLERS WITH AIR FLOW c37
Motokazu Fukuda and Naoya Kojima *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 205-214 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

Transmission loss characteristics of a reactive type muffler were studied under the assumption that the tail pipe of the muffler is a non-reflective one. On the assumption that the pipe is completely reflective, attenuation theory was developed. In the case of a muffler with air flow, however, these equations are not always correct in estimating frequency characteristics of noise reduction. This is because of the change in these characteristics due to the air flow or a secondary noise inside the muffler. The influence of air flow on the relationship between the figure of the reactive type muffler and the noise radiated from it was studied. The sources of the air flow noise inside the cavity were sought. Futhermore, air flow noise was estimated by means of calculation and experiment. As a result, many interesting conclusions were obtained together with important data for the muffler design. B.G.

N85-18185# Yamaguchi Univ. (Japan). Dept. of Chemical Engineering.
MECHANISM AND PROCESS OF FLOCCULATION BY POLYMERIC FLOCCULANT c45
Kunihisa Osasa, Masao Sambuichi, and Hideo Nakakura *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 215-224 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

The flocculation-sedimentation performances were assessed with polymeric flocculants addition to wastewater. The batch flocculation test was carried out using a large scale reactor (the capacity of 10 liters) instead of the conventional jar tester. The techniques described permits close control of the optimum flocculant dosage and makes it possible to determine the magnitude of mixing. Author

N85-18186# Yamaguchi Univ. (Japan). Dept. of Civil Engineering.
STUDIES ON SEISMIC EARTH PRESSURE OF COHESIVE BACKFILL
Sukeo O-Hara and Hiroshi Matsuda *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 225-238 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

A resultant force and a distribution of seismic earth pressure acted on a movable model wall was measured using a shaking table test. Sand used in the tests is slightly cohesive. It was found that the results agree with the theoretical calculation. The critical seismic coefficients for the base sliding of the gravity type quay walls were obtained by using the calculation and it was shown that the seismic damage can be well explained with this criterion. Author

N85-18187# Yamaguchi Univ. (Japan). Dept. of Civil Engineering.
CREEP DEFORMATION OF COMPACTED DECOMPOSED GRANITE SOILS
Sukeo OHara and Hiroshi Matsuda *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 239-248 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

In order to investigate the characteristics of time dependent deformation on the decomposed granite soils, the drained triaxial compression tests were performed under loading the constant deviator stress. Two kinds of samples with different grain size distributions were prepared to investigate the effects of the grain size and the particle crushing on the deformation. As a result, it was observed that there existed creep deformations on the compacted sample, and especially in the creep tests, whether the specimen attained the failure or not was essentially different; in the former case, the dilatancy increases and in the latter case, the shrinkage does. Author

N85-18188# Yamaguchi Univ. (Japan). Dept. of Civil Engineering.
ON THE VIRTUAL WALL HEIGHT IN OPEN CHANNEL FLOW WITH LARGE RELATIVE ROUGHNESS c34
Takashi Saitou, Kesayoshi Hadano, Masafumi Kamachi, and Hajime Honmyo *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 249-256 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

In order to apply the logarithmic velocity distribution law to open channel flows with rough beds, it is necessary to define the equivalent roughness and the virtual wall height. The equivalent roughness and the virtual wall height were estimated previously with a measured velocity distribution. However, when the relative roughness is large, the region where the logarithmic velocity distribution should hold is restricted in a narrow region of a flow. In the flow with large scale relative roughness, therefore, an error of estimation of the virtual wall height from the velocity distribution necessarily becomes large, and the virtual wall height must be determined with the wall shear stress measured directly. From this point of view the wall shear stress was measured directly using a servo typed shear stress meter, and the virtual wall height examined. In spite of the same arrangement of the roughness elements, the virtual wall height depends on the relative depth and the slope of the flume. Author

N85-18189# Yamaguchi Univ. (Japan). Dept. of Electrical Engineering.
THE ROLE OF FAST ELECTRONS FOR THE PERFORMANCE CHARACTERISTICS OF HYDROGEN ION SOURCES c72
Osamu Fukumasa and Setsuo Saeki *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 257-268 refs (For

primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

The influence of fast primary electrons on the ion species ratios in a hydrogen plasma is discussed numerically. The optimum condition for plasma production with high proton ratio is to eliminate the presence of fast electrons, whereas the production of H(-) ions is enhanced anomalously by the presence of fast electrons. Author

N85-18190# New Hampshire Univ., Durham. Marine Systems Engineering Lab.
TECHNOLOGY DEVELOPMENT FOR UNMANNED UNTETHERED SUBMERSIBLE VEHICLE SYSTEMS Final Report, 1 Aug. 1981 - 31 Jan. 1984
Jun. 1984 227 p
(Contract N00014-81-C-0756)
(AD-A148794; Rept-4-21292-84-1-P) Avail: NTIS HC A11/MF A01 CSCL 13/10

This document describes a program focused on technologies pacing the development of unmanned untethered submersible vehicle systems. Specifically this program has focused on the objective of an Arctic Inspection Mission System (AIMS). This program was to develop and demonstrate the technology required to perform under-ice mapping of the ocean floor as well as the ice keel employing an untethered autonomous submersible. The areas of technology addressed in this regard were: (1) A sonar sensor array to perform the mapping; (2) An autonomous untethered submersible vehicle system; (3) A method of storing the large amounts of data; (4) Computer requirements to perform this task; and (5) Definition of a navigation system suitable for the AIMS mission. GRA

N85-18191# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
DURABILITY AND BEHAVIOR OF PRESTRESSED CONCRETE BEAMS. POSTTENSIONED CONCRETE BEAM INVESTIGATION, SUPPLEMENTAL LABORATORY TESTS OF BEAMS EXPOSED FROM 1961 TO 1982
E. F. ONeil and G. L. Odom Oct. 1984 46 p
(AD-A148821; AD-E700011; WES-TR-6-570-6; Rept-6) Avail: NTIS HC A03/MF A01 CSCL 13/13

This report is the sixth in a series describing a study being conducted to develop information on the durability of prestressed concrete beams. This phase of the study is concerned with field and laboratory testing and with observation of posttensioning systems including end anchorages, end anchorage protection, posttensioning conduit, and posttensioning wires. In June 1961, 20 air-entrained, posttensioned concrete beams were placed at the Treat Island, Maine, exposure station. The beams were fabricated using four different types of posttensioning systems with 12 different types of end anchorage protection over external and flush anchorages. End anchorage protection was attached to the beams using six different types of joint preparation: bush-hammering, epoxy adhesive on sandblasted surface, retarding agent, sandblasted, sandblasted with primer, and no preparation. The end protections were made from three different mixtures: portland-cement concrete, epoxy concrete, and sand mortar. Eight beams were returned to the Waterways Experiment Station (WES) for autopsy and testing in September 1973 and December 1974. These beams were tested to determine the effects of severe environment described above on the posttensioning system. In January 1983, three more beams were returned to WES from Treat Island for autopsy and additional testing. The results of these additional tests are the subject of this investigation. If no further tests are made on the nine posttensioned beams that remain at Treat Island, this report will be the final report in the series. GRA

N85-18192# Army Construction Engineering Research Lab., Champaign, Ill.
FIELD TESTING OF A LIGHTWEIGHT RELOCATABLE STRUCTURE IN A DESERT ENVIRONMENT Final Report
A. Kao, S. Lane, J. Carr, L. Wahlgren, and P. Klause Sep. 1984 79 p
(DA Proj. 4A1-62731-AT-41)
(AD-A148841; CERL-TR-M-361) Avail: NTIS HC A05/MF A01 CSCL 13/13

This report describes the field tests of a commercially available, off-the-shelf lightweight relocatable structure (LRS) systems selected for possible military application in a theater or operations. The structural system selected for the field tests was a panelized system manufactured by Kelly Klosure, Inc. The purpose of the tests was to determine the constructibility and habitability of the building system. The tests are being conducted in two stages: Stage 1 tests were conducted in a desert environment, and Stage 2 tests are being conducted in a temperate environment. This report documents the results of the Stage 1 tests. The test results showed that the 20-ft-wide and 8-ft-high building can be erected manually by unskilled troop labor using only hand tools. However, for a 12-ft-high building assembled using 4- x 8-ft panels, a crane is needed to help lift assembled components for the erection. Based on overall constructibility and environmental performance, the fiberboard panel system is the better choice. Several modifications were made to the system during the field tests. It is recommended that these modifications be incorporated into system design and further field tests conducted before making a final evaluation. GRA

N85-18193# University City Science Center, Philadelphia, Pa.
MANUFACTURING COSTS, EQUIPMENT NEEDS AND TECHNOLOGICAL OPPORTUNITIES AMONG SMALL AND MEDIUM-SIZE MANUFACTURERS
F. W. Kirsch May 1984 8 p
(Contract DE-FC01-83CE-40654)
(DE85-000479; DOE/CE-40654/T1) Avail: NTIS HC A02/MF A01

During a series of 54 performance evaluation interviews conducted during March and April, 1984, 15 plant representatives were chosen for a further confidential interview about their plants' overall manufacturing costs, their equipment needs, and the opportunities they envision for research, development, and technology transfer. Manufacturers' response are summarized to a series of questions designed to elicit useful information about: the factors that contribute most to their plants' manufacturing costs; the manufacturers' preferred approaches to increasing their plants' profitability; perceived management needs for new equipment, its availability, and barriers to purchasing it; plant management's attitude toward the potential for research and development (R and D) to improve product quality; and the same persons' estimates of whether the R and D will be done within five years (if needed) and by whom. In addition to summarizing that information, an analysis of the patterns which these responses reveal and observations about the priorities which they indicate are described. DOE

N85-18194# Los Alamos Scientific Lab., N. Mex.
METALLOGRAPHIC GRINDING EFFICIENCY
K. A. Johnson Sep. 1984 9 p refs
(Contract W-7405-eng-36)
(DE85-001520; LA-10215-MS) Avail: NTIS HC A02/MF A01

The efficiency of material removal from metallographic mounts is reported. Grinding papers, lubrication rate, lubricant's speed, and hold-down weight are compared and evaluated. Data are presented that indicate that the application of several principles can lead to significantly increased grinding rate efficiency. DOE

N85-18195# Illinois State Univ., Normal.
HYBRID SYSTEM FOR PRODUCING AND STORING ICE
C. E. Francis, R. C. Larash, and A. J. Gorski (Argonne National Lab.) 1984 6 p refs Presented at the 9th Natl. Passive Solar Conf., Columbus, Ohio, 23 Sep. 1984
(Contract W-31-109-ENG-38)
(DE84-017474; CONF-840954-6) Avail: NTIS HC A02/MF A01

Refrigeration, cooling and/or chilling methods usually require rather large amounts of energy for operation. This system uses naturally frozen ice in long term storage to provide an economical

source of ice for various cooling or chilling purposes. Initial research and computer simulations indicate that in areas where the winter is suffuciently cold and of sufficient duration, this system would be an economical, viable option for uses such as simple refrigeration, summer air conditioning, or simply for effective dehumidification. In a 36 day melting period in June and July 1984, the system ran nearly continuously for 768 hours, recovering a total of 743 tons of cooling with an estimated 5 to 8% of the stored cooling capacity remaining. The seasonal melting loss was approximately 50% of the stored capacity. DOE

N85-18196# Rolls-Royce Ltd., Derby (England).
FLEXIBLE MANUFACTURING SYSTEM FOR MACHINING AXIALLY SYMMETRIC WORKPIECES
G. Spur 9 Nov. 1984 21 p refs Transl. into ENGLISH from ZwF, v. 71, no. 2, 1976
(PNR-90229; Trans-16502/TLT-00915) Avail: NTIS HC A02/MF A01

Systems for direct control of independent numerically controlled manufacturing equipment (DNC systems) are discussed. Such systems comprise a process computer with control and storage peripherals, a coupling element, data transfer lines and DNC additions to the numerical controls in the manufacturing process. Basic DNC functions are the management and output of NC data. Larger DNC systems also amend NC data, receive and process resulting working data and issue information for guidance. A system for machining axisymmetric workpieces based on this concept was successfully tested. Author (ESA)

N85-18197# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
INFLUENCE OF GRAIN SIZE DISTRIBUTION ON THE UNDRAINED DYNAMIC PROPERTIES OF SATURATED SAND M.S. Thesis - Colorado Univ.
Richard L. McNearny Jul. 1984 184 p refs
(PB85-102382/GAR) Avail: NTIS HC A09/MF A01 CSCL 08M

The majority of previous research on dynamic properties of clean sand involved either dry sands or saturated sands subjected to drained cyclic loading tests or undrained tests which allowed for excess pore pressure dissipation between each cycle of loading. Dynamic properties were determined at small shear strain amplitudes. Further, the influence of grain size distribution was not systematically studied. Dynamic properties were evaluated from each hysteresis loop produced by an undrained cyclic triaxial test. The analysis of statistical correlation was performed to determine the strength of correlation between the dynamic properties and factors such as the influence of the number of loading cycles, the shear strain amplitude, and the grain size distribution characteristics. A functional relationship was developed between the dynamic shear modulus and shear strain. GRA

N85-18198# National Bureau of Standards, Washington, D.C.
FORTRAN 77 COMPUTER PROGRAM FOR TEST PROCEDURE CALCULATIONS OF VENTED HEATERS
Robert A. Wise and Fletcher C. Parsons Sep. 1984 53 p refs Sponsored in part by DOE
(PB85-109627/GAR; NBSIR-84/2918) Avail: NTIS HC A04/MF A01 CSCL 13A

The FORTRAN 77 computer program described is used to calculate results from tests run on vented heaters. The Department of Energy published a revised test procedure for such heaters but which contains a simplified method for testing with a number of testing options that allow more detailed tests to be run. The procedure provides for the testing of units with manual controls of two types, modulating controls of two types, and the testing of units incorporating thermal stack dampers as well as electromechanical dampers. Once input selections have been made, the program performs the calculations required and prints out the results. GRA

N85-18199# National Bureau of Standards, Gaithersburg, Md.
PRIMER FOR MASS METROLOGY Final Report
K. B. Jaeger (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.) and R. S. Davis Nov. 1984 90 p refs
(PB85-121424/GAR; NBS/SP-700-1; LC-84-601090) Avail: NTIS HC A05/MF A01; Also avail. from SOD as SN003-003-02621-2 CSCL 14B

This paper attempts to fill the need for a coherent guide to the many publications which document the NBS program in mass metrology. The topics emphasized are generally those which experience has shown to present the greatest difficulties for metrologists new to the field of mass measurements. Many worked examples are included. Steps often omitted in more scholarly treatments of the same subjects are retained. A full bibliography is included so that the reader may also consult the primary sources of this work. GRA

N85-18200# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ENGINEERING AND EQUIPMENT Abstracts Only
10 Jan. 1985 41 p Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-85-001) Avail: NTIS HC A03

Various topics in the areas of engineering and equipment are investigated in this U.S.S.R. report. Topics covered include: (1) turbine and engine design; (2) navigation and guidance systems; (3) fluid mechanics; and (4) mechanics of solids. For individual titles, see N85-18201 through N85-18223.

N85-18201# Joint Publications Research Service, Arlington, Va.
DESIGNING THE PROFILE OF TURBINE BLADES USING AN ITERATION TECHNIQUE Abstract Only c34
G. A. Sokolovskiy and V. A. Vanin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 13 Transl. into ENGLISH from Probl. Mashinostr. (Kiev), no. 19, Nov. 1983 p 85-87 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

Partial integro-differential equations describing the gas flow in a plane turbine cascade are solved to determine the blading profile which provides a pressure distribution close to a specified form when an ideal gas flows through the stage. The set pressure distribution over the profile contour should satisfy the conditions of the most advantageous flow from the standpoint of energy losses. The maximum pressure difference between the concave and convex sides must be generated in order to provide the greatest lift force. The quantities specified at the inlet cross section are the pressure of the retarded flow, the braking temperature and the direction of the velocity; the quantity specified for the output cross section is the static pressure. An algorithm is written in ALGOL-GDR for the BESM-6 computer which has been approved for the study of subsonic and transonic vane blading profiles. The algorithm starts with an initial approximation and then establishes the optimal configuration through a short series of iterations by changing the shape of just the convex surface. B.W.

N85-18202# Joint Publications Research Service, Arlington, Va.
CALCULATING SECONDARY NONVISCOUS GAS FLOWS IN SPATIAL CASCADES OF TURBINES Abstract Only c34
V. I. Gnesin and V. G. Solodov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 14 Transl. into ENGLISH from Probl. Mashinostr. (Kiev), no. 19, Nov. 1983 p 91-95 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The flow of an ideal gas in the stationary channels of turbine machines in the presence of an overall pressure gradient in the channel cross section is accompanied by secondary flows, which must be considered when optimizing the efficiency of the blading. The flow through a ring cascade which consists of the blading of a high pressure nozzle stage is studied numerically. The vorticity of the flow is specified in terms of the total pressure distribution at the input to the region being analyzed. The spatial flows modeled in this way are compared with a set of two dimensional flows at the axially symmetric surfaces of rotation (the main flow) for various total flow pressures and temperatures. The spatial flow of the gas is treated as the superposition of this main flow and the secondary flow which appears at surfaces with current lines orthogonal to

the main flow. The total pressure in this numerical example is assumed to have a parabolic distribution with a maximum of 117 KPa and a minimum of 100 KPa; the temperature is 315 K and the flow entrance angle is 90 deg. The structure of the secondary flow is illustrated in different channel cross sections. B.W.

N85-18203# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF TOTAL PRESSURE LOSSES IN STEPPED ANNULAR DIFFUSORS WITH CURVILINEAR OUTER WALLS AND UNIFORM VELOCITY FIELD AT INLET Abstract Only **c34**
A. Ya. Dantsyg and N. M. Petrov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 15 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 63-66 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The influence of the shape of the generatrix of the exterior wall of a diffusor is studied for five outer wall configurations with generatrices in the form of two circular arcs, run tangentially to the inlet and outlet cylindrical sections. The variable geometric parameter for the study is the relative axial coordinate of the point of inflection of the curve in the outer wall. The coefficients of shock attenuation which characterize the total pressure losses in such diffusors with a uniform velocity field at the input are plotted as a function of the geometric variable and the normalized inlet velocity. The method of least squares is applied to the data in order to derive an analytical formula for the losses, which is written as a third order polynomial. As the inlet flow velocity increases, diffusors with curvilinear outer walls ultimately have 25% lower losses than the same diffusor with a straight wall. When the curvature point of inflection is a particular distance beyond the diffusor outlet, the curvilinear outer walls provide no advantage over their straight counterparts. B.W.

N85-18204# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF NORMALIZED FREQUENCY ON TIME-DEPENDENT AERODYNAMIC CHARACTERISTICS OF VANE BLADING PROFILES Abstract Only **c34**
V. I. Gnesin and S. V. Yershov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 15-16 Transl. into ENGLISH from Probl. Mashinostr. (Kiev), no. 19, Nov. 1983 p 88-91 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

Time dependent flow through mutually moving vane blading profiles is characterized by the frequency k = fz sub 1 b/2V, where f is the angular velocity of the rotor, z sub 1 is the number of blades of the fixed cascade, b is the working blade chord and V is the relative flow velocity. Different normalized frequencies can be obtained by changing the angular velocity fz sub 1 of the step nonuniformity wave along the casacade front in the gap between the guides and the rotor; fz sub 1 = 0 applies to the quasisteady state flow hypothesis. This paper proposes a method of specifying the normalized frequency, which ascertains its impact on the time dependent parameters of the vane blading while observing Mach number similitude and geometric similitude. A complete system of time dependent equations of gas dynamics and the explicit finite difference scheme of S. K. Godunov is applied to the case of two mutually moving cascades with the following characteristics in a normalized frequency range of k = 0 to 6; z sub 1 = 66, z sub 2 for the working cascade (rotor) = 110, relative nozzle cascade step is t sub 1/b sub 1 = 0.49, that of the rotor is t sub 2 b sub 2 = 0.57, the rotor speed is 157 rad/sec and the ratio of the static pressure per stage to the total pressure is p sub 2/p sub 0 = 0.16. B.W.

N85-18205# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SECONDARY FLOW RATE ON DYNAMIC STRESSES IN TURBINE ROTOR BLADES Abstract Only **c34**
G. D. Shekun *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 16-17 Transl. into ENGLISH from Teploenerg. (Moscow), no. 2, Feb. 1984 p 65-66 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

A drawback to previous methods of estimating the dynamic stresses during turbine rotor blade vibration, which are based on studies of the degree of flow velocity nonuniformity in the gap between blading rings, is the lack of data on the extent of flow nonuniformity parameters in the end regions. The dynamic stresses from bending and torsional oscillations of turbine rotor blades were determined at the fundamental frequency of the resonant bending oscillations. The qualitative picture of the impact of secondary flow rates in the end regions on the dynamic stresses is discussed. The experimental configuration for the strain gauge measurements is illustrated. The secondary flows are controlled by means of additional vanes which are inserted between the rotor blades to reduce the level of stress both at the tip and root of the blades. The dimensions of added vane for optimal stress reduction are given. The measured dynamic stresses at the blade roots are shown to be the total bending and torsional oscillation stresses of the rotor blades. R.S.F.

N85-18206# Joint Publications Research Service, Arlington, Va.
ON ONE DESIGN PRINCIPLE OF SURGE PROTECTOR FOR GAS TURBINE ENGINE COMPRESSOR Abstract Only **c37**
M. M. Shakiryanov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 17 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 97-99 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

Gas dynamic instability in the compressors of gas turbine engines, i.e., surging, can cause the failure of the compressor and the entire engine. The design is described for a surge detection and correction system based on the parameter L sub a/k(C sub a) flow parameters K is a throttling resistance coefficient. L sub a is expressed in terms of the length and cross section of the intake pipe and the air density in the pipe; C sub a is in terms of the air density and volume and the speed of sound following the delivery pipe. A specific algorithm is derived which describes the gas dynamic state of the engine and a block diagram of an antisurging system is presented. The proposed protector detects surging quickly with a sharp change in the temperature or pressure at the engine intake. When surge oscillations are due to other factors, the pressure increase following the compressor changes, which also actuates the protector. R.S.F.

N85-18207# Joint Publications Research Service, Arlington, Va.
ON SELECTING BYPASS MIXERS FOR TURBOFAN ENGINES Abstract Only **c07**
B. D. Fishbeyn *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 18 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 94-96 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The performance of turbofan engines can be enhanced by boosting the bypass ratio up to 6.5 to 7.0 in bypass mixing systems. A factor taking into account the energy losses of the mixed streams was adduced and used in writing an expression for the relative change in the output impulse. Equations were then derived for the best case bypass ratio and curves were plotted to determine the isodynamic lines for turbofan engines with bypass ratios of between 0.5 and 8.0 for various increases in the output impulse. When the bypass ratio is greater than 2.0, the maximum possible relative rise in the output impulse falls off continually and is approximately 220% lower when the ratio is 8 than when it is 2.0. However, because of the increase in the thrust gain with the increase in the bypass ratio, the relative gain in the thrust is nearly constant. Turbofan engines with high bypass ratios of 4 to 8 can achieve the maximum thrust increase by means of an efficient mixer. R.S.F.

N85-18208# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SETTING ANGLE OF JET COOLING NOZZLES ON TEMPERATURE AND STRESS STATE OF A TURBINE

WHEEL Abstract Only **c07**
V. V. Zhuykov, Ye. I. Lashuk, and Yu. I. Yunkerov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 18-19 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 77-80 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

Turbine wheels in gas turbine engines are cooled by coolant jets directed onto the disk surface. The setting angle of the jet nozzles has an impact on the heat transfer coefficients in the blasted region of the wheel. The temperature and stress states of the turbine wheel of a full scale, small gas turbine engine were analyzed mathematically. The temperature distribution over the center line of the meridianal section of a wheel was plotted for nozzle setting angles of 60 deg and 90 deg. The mounting of the nozzles at the optimum angle with respect to the end face surface reduces the average disk temperature by more than 30 K. Setting the nozzles at an angle of 60 deg increases the disk strength reserve by up to 5% in the region of maximum stresses and up 5.3% in the nozzle mounting area. The distribution of the radial and tangential stresses was also plotted over the section line of the wheels for the two setting angles of 60 deg and 90 deg.
R.S.F.

N85-18209# Joint Publications Research Service, Arlington, Va.
IMPROVEMENT OF GAS TURBINE ENGINE PERFORMANCE BY WATER INJECTION INTO TURBINE COOLING AIR Abstract Only **c37**
G. M. Gorelov, V. P. Danilchenko, and V. Ye. Reznik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 19-20 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 19-20 Original language document was announced in IAA as A84-25569 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

Two methods of reducing the temperature of the cooling air in a high-pressure turbine, one involving injection of water and the other the use of a heat exchanger, are analyzed. It is shown that even for moderate relative cooling depths of the blades (0.4-0.5), the injection of water into the cooling system makes it possible to substantially reduce the specific fuel consumption of the engine. The use of a heat exchanger, however, leads to a noticeable increase in fuel consumption during cruising flight due to hydraulic losses. V.L. (IAA)

N85-18210# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF AERODYNAMIC SHIELDING OF TURBOJET ENGINE AIR INTAKE AGAINST EXHAUST GASES Abstract Only **c07**
M. M. Vysokogorets, M. Sh. Gilyazov, V. A. Kosterin, and M. G. Khabibullin *In its* USSR Rept. Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 20 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 60-63 Original language document was announced in IAA as A84-25567 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The use of an aerodynamic shield is a promising method for preventing the entry of high-temperature exhaust gases into the intake of a turbojet engine during the landing of aircraft equipped with reverse-thrust devices. The objective of the study reported here was to investigate experimentally the efficiency of aerodynamic shielding by a single circular jet issuing in the plane of symmetry of the intake at 90 deg to the surface of the runway. The mean temperature at the pair intake is determined as a function of the total air pressure and of the critical flow rate of the shielding air for a turbojet engine intake model. V.L. (IAA)

N85-18211# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF INFLUENCE OF SIZE OF UPPER AND LOWER LAPS ON OPERATIONAL EFFICIENCY OF CENTRIPETAL FULL-INLET AIR DRIVEN MICROTURBINES Abstract Only **c37**
N. P. Tikhonov, A. N. Tikhonov, and S. M. Gracheva *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 21 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 42-46 Original language document was announced in IAA as A84-25562 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

It is shown that in full admission inward flow microturbines, the optimum values of the upper and lower overlaps of the rotor and nozzle diaphragm blades are largely determined by the expansion ratio and do not depend on the radial clearance. By optimizing the overlaps, it is possible to increase the efficiency of an inward flow microturbine by 6 to 20%. The results of the study have been verified for microturbines with external wheel diameters of 25 to 80 mm and nozzle diaphragm blades 1 to 3 mm high.
V.L. (IAA)

N85-18212# Joint Publications Research Service, Arlington, Va.
CALCULATING HEAT TRANSFER COEFFICIENTS FOR TURBINE PROFILES TAKING SURFACE CURVATURE AND ELEVATED FLOW TURBULENCE INTO ACCOUNT Abstract Only **c34**
V. D. Sovershennyy and S. P. Chikova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 21-22 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 38-42 Original language document was announced in IAA as A84-25561 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

Local coefficients of heat transfer to a turbine profile are determined with allowance for surface curvature and high flow turbulence by integrating numerically partial differential equations for the boundary layer. It is assumed that the boundary layer contains zones of laminar, transition, and turbulent flows. A closed system of equations is obtained by using full transport coefficients. The heat transfer coefficients calculated for turbulences of 0.45 and 5.9% are found to be in good agreement with experimental data. V.L. (IAA)

N85-18213# Joint Publications Research Service, Arlington, Va.
CORRECTION OF ENGRAVING STAMP FOR FORMING BLANKS OF GAS TURBINE ENGINE BLADES Abstract Only **c37**
V. Yu. Zykov, A. F. Pavlov, L. T. Kazakova, and F. S. Yunusov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 22 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 27-32 Original language document was announced in IAA as A84-25559 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

In precision die forging of gas turbine blades it is essential that the configuration of the die be corrected to allow for the deformations resulting from residual stresses. A correction procedure is proposed here which involves developing a mathematical model describing the surface of the blade, calculating the coordinates of the forged blank profile, calculating the coefficients of the polynomials describing the blank profile, and correcting the impression of the die. The correction algorithm has been implemented in software written in FORTRAN 4. V.L. (IAA)

N85-18214# Joint Publications Research Service, Arlington, Va.
SPEED GOVERNOR FOR DIESEL ENGINE Abstract Only **c37**
Ye. Kh. Kadyshevich, M. A. Miselev, and N. N. Svistunov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 23 Transl. into ENGLISH from Sudostr. (Leningrad), no. 3, Mar. 1984 p 25-26 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

A speed governor was developed for the 12ChSN 18/20 ship diesel engine to reduce emission of fumes and eliminate transient overloads, with pneumatic correction of the fuel injection rate according to the supercharge pressure. The device includes an electric corrector, and a hydraulic amplifier with slide valve. It is found that the regulator improves the performance, including torque and combustion characteristics and reduces the emission level to

15% within 2 s and decreases only to a 65% level. It was also tested on a Kometa hydrofoil ship with regulation of the diesel start over an 80 to 90 s acceleration period independently of the crank turning time, and maintained overloads and fume emission within prescribed limits. E.A.K.

N85-18215# Joint Publications Research Service, Arlington, Va.
USE OF BRAKING STAGES FOR CONTROL OF TURBINE SPEED Abstract Only c37
Yu. M. Pogodin, A. M. Topunov, and A. I. Chernov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 23-24 Transl. into ENGLISH from Sudostr. (Leningrad), no. 6, Jun. 1984 p 20-22 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The external characteristics of small turbines on ships can be varied through reduction of the limiting specific speed. The object is to obtain a steep efficiency speed curve asymmetric with respect to the maximum efficiency point. A special device to cut into the operation as required was developed. The device is a brake inserted into the diaphragm of an intermediate guide stage between two runner stages. It consists of two adjoining ring segments, a shorter one which carries vanes oriented relative to the nozzle for maximum efficiency in the base mode of operation, and another approximately 40% longer which carries vanes with their concave side in the direction of rotation for braking. The theoretical principle was tested with two such braking stages in a turbine operating at two speed levels. E.A.K.

N85-18216# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL SATELLITE SYSTEM FOR DETERMINING COORDINATES OF MARITIME DISTRESS Abstract Only c15
I. S. Bronitskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 25 Transl. into ENGLISH from Sudostr. (Leningrad), no. 2, Feb. 1984 p 40-42 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The international KOSPAS-SARSAT system being developed jointly by the Soviet Union, the United States, Canada and France for locating maritime distress at sea or in the air is discussed. The basic tasks in the experimental stage are to demonstrate the technical feasibility of detecting distress, to establish the mode of interaction of such a system with national search and rescue operations, and to establish guidelines for pilot operation of the experimental prototype. Both parts are designed to function either separately or jointly. Distress signals are amplified and detected, after frequency conversion, in real time. The ARB-406 emergency radio buoyts are designed to operate with Kosmos 1383 and Kosmos 1447 satellites orbiting respectively at 1004 to 1041 km and 975 to 1025 km altitudes. The format of messages transmitted by these buoys is laid out for joint KOSPAS-SARSAT operation. This experimental system will be used to equip some ships and aircraft with its satellite communication components. E.A.K.

N85-18217# Joint Publications Research Service, Arlington, Va.
ON VORTEX TRANSPORT IN TURBINE CHANNELS Abstract Only c34
A. A. Bykov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 29 Transl. into ENGLISH from Probl. Machinostr. (Kiev), no. 19, Nov. 1983 p 95-97 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The system of equations of motion and continuity describing the steady state vortex flow of a nonviscous incompressible fluid represents a quite difficult problem concerning the construction of a numerical method of solution and the application of physical boundary conditions. Such a system, written in terms of the velocity vector, pressure, density and total energy, can be written so that the equations correspond with the classical problem of finding a velocity field from a specified divergence and vortex field, which can be solved by the method of integral equations. The vortex transport equation is algebraic with respect to the velocity vector fields and can be used to determine the vortex field in a turbine channel by an iterative technique with the appropriate boundary conditions. The distributions of the current functions is known and the total energy at any point in the channel is defined by a given function. One feature of this analytical solution is the use of a family of current surfaces for the coordinate system. The efficiency the vortex field determination throughout the entire internal region of a channel because the labor involved in setting up the current surface system of coordinates is payed back by an analytical function which defines the vortex field everywhere in the region. E.A.K.

N85-18218# Joint Publications Research Service, Arlington, Va.
TURBULENT JET FLOW IN A CHANNEL WITH A CIRCULATION REGION Abstract Only c34
G. A. Glebov and V. N. Petrov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 104-105 Original language document was announced in IAA as A84-25583 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

An approximation method is proposed for calculating flows resulting from the interaction between a turbulent jet and a slipstream inside a duct, including the case where a back stream is formed near the wall. In accordance with the approach proposed here, the velocity profile in the mixing region is determined using the well known method of the polynomial approximation of the Reynolds shear stress profile in the duct cross-sections. The flow parameters are then determined using integral equations of flow rate and momentum. The results obtained using the approximation method are found to be in good agreement with experiment data. V.L. (IAA)

N85-18219# Joint Publications Research Service, Arlington, Va.
ON LIMITS OF APPLICABILITY OF LINEAR MODELS TO DYNAMICS OF GAS CHANNELS IN AIRCRAFT ENGINES Abstract Only c07
A. V. Baykov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 30-31 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 101-104 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The analysis of the dynamics of gas channels in aircraft engines is usually based on the equations of gas dynamics in a linear approximation. The various linearizations of the initial equations described in the literature are sometimes contradictory. An approach to the study of nonlinear oscillations based on an analysis of Burgers equation from nonlinear acoustics is presented which permits precise solutions in order to ascertain the effect of various factors on the propagation of finite amplitude oscillations in engine channels. A simple diagram plotting a coefficient which accounts for gas motion through the channel as a function of a factor describing the attenuation of oscillations in the system is used to illustrate the areas of applicability of various linear models. The diagrams show the areas where convective transport, frictional resistance, gas motion in the channel, gas flow oscillation amplitude or nonlinear effects must be considered or can be disregarded. Author

N85-18220# Joint Publications Research Service, Arlington, Va.
LONG RANGE EFFECT OF TURBULENT PRESSURE PULSATIONS IN PLANE-PARALLEL FLOWS AT DIFFERENT VELOCITIES WITH VARIOUS FLAME FRONTS Abstract Only c34
G. N. Abramovich and V. B. Rutovskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 31 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 3-10 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

The levels of turbulent velocity and pressure pulsations in a diffusion flare both with and without a slipstream in the flow are calculated. The analytical expressions are derived from a plane model in which the vortices are replaced by rotating cylinders having axes perpendicular to the flow and radii proportional to an

integral turbulence scale; the flow originates from two planar nozzles of substantially different size. The resulting formulas for these pulsations and the estimate of the increase in the turbulence in the presence of a flame front are in good agreement with test data. Pressure pulsations are independent of the density distribution at a nozzle section, while this density is the critical factor in determining the pulsation velocity field. When the nozzles are sufficiently close together, two velocity pulsation maxima are to be expected and their position can be computed beforehand. The case when the distance to the boundary of the second nozzle is small and both streams merge rapidly into a common flow is also considered. A.R.H.

N85-18221# Joint Publications Research Service, Arlington, Va.
ANTIFRICTION NICKEL-PHOSPHOROUS COATINGS ON ALUMINUM ALLOY PRODUCTS Abstract Only **c26**
V. I. Latutuyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 32 Transl. into ENGLISH from Vestn. Mashinostr. (Moscow), no. 2, Feb. 1984 p 71 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

A nickel-phosphorous coating having a hardness of up to 900 to 1,200 kg/sq mm following heat treatment and an adhesion which depends on the processing of the aluminum alloy surface is quite promising for chemical application of the surfaces of aluminum based friction pairs which otherwise exhibit poor hardness and rapid wear. Such coatings have improved antifriction properties at phosphorous contents of from 2 to 15%. The following surface treatment procedure was approved for use at the Transportation Machine Building Plant imeni Lenin in Barnaul. The aluminum surface is degreased in an organic solvent, etched in a 10% NaOH solution and then flushed with water after a maximum of 70 seconds. The surface is neutralized with concentrated nitric acid for 5 to 7 seconds, flushed with water again and exposed to contact application of the nickel in a solution of nickel sulfate, ammonium or sodium fluoride and HCl. After flushing with a nickel and sodium salt and acid solution, a tight nickel-phosphorous coating is formed with good adhesion to the aluminum substrate. The adhesion and hardness are enhanced considerably following heat treatment for two hours at 230 + or - 10 C. Author

N85-18222# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF BLADE SERVICE LIFE UNDER IRREGULAR LOADING CONDITIONS Abstract Only **c38**
V. S. Sokolov and A. I. Lebedeva *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 32-33 Transl. into ENGLISH from Teploenerg. (Moscow), no. 2, Feb. 1984 p 24-27 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

Service life of turbine blading subject to irregular varying loads was determined by: (1) the distribution of the dynamic stresses found at resonance; (2) determination of fatigue characteristics of the vane blade and root from samples during symmetrical loading cycles; (3) load coefficient; and (4) fatigue crack occurrence. The service life of the vane blades of a turbine for a feed pump are calculated. By knowing the operational loading of the blading and the fatigue parameters, the probability of blade failure can be determined for any specified turbine service life. B.G.

N85-18223# Joint Publications Research Service, Arlington, Va.
ON SOLVING NONLINEAR PROBLEMS OF AIRCRAFT STRUCTURAL MECHANICAL DESIGN Abstract Only **c05**
S. K. Chernikov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 33-34 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 105-107 Original language document was announced in IAA as A84-25584 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

In nonlinear problems concerning the stress-strain state of structures, an operator control equation is usually reduced to a system of nonlinear algebraic equations using finite-difference, finite-sum, or some other well known techniques. The problem is then reduced to that of finding the roots of the nonlinear system. An approach to the solution of the nonlinear system of equations is proposed here which is based on the parameter continuation algorithm. Two versions of the approach are examined and shown to be superior to other methods. V.L. (I.A.A.)

N85-18224# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
18 Jan. 1985 97 p refs Transl. into ENGLISH from various west European articles
(JPRS-WST-85-003) Avail: NTIS HC A05/MF A01

Various aspects of science and technology are discussed in the West Europe Report. Areas of study include: (1) advanced materials; (2) optical computers; and (3) the use of robots in factory automation. For individual titles, see N85-18225 through N85-18229.

N85-18225# Joint Publications Research Service, Arlington, Va.
FRG FIRMS JUMP INTO MARKET FOR AUTO, AIRCRAFT CERAMICS **c27**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 1-3 Transl. into ENGLISH from Industriemag. (Munich), 15 Oct. 1984 p 97; 100 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

Production engineering and marketing concerns for constructive ceramics for engine construction and machine construction are discussed. The springboard for marketing research is to be provided by a pilot plant which is now being set up by the porcelain manufacturer in the Upper Franconian city fo Naila. Tailored construction components made of ceramic materials to support high stresses in engine construction, machine construction and plant construction as well as in energy and environment technology are described. B.W.

N85-18226# Joint Publications Research Service, Arlington, Va.
FRG RADIOTELESCOPE MADE OF CARBON FIBER-REINFORCED PLASTIC **c27**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 4 Transl. into ENGLISH from Produktion (West Germany), 30 Aug. 1984 p 2 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

Within the framework of its activities in research and in applications of new materials in aeronautics and astronautics and in adjacent areas of technology the Friedrichshafen Dornier System GmbH has developed the carbon fiber-reinforced plastic radiotelescope. This is the first reflector in the world made of carbon fiber-reinforced plastic (CFK) having a 10-meter diameter for a submillimeter radiotelescope. Using a conventional steel mounting by Krupp the telescope is to be erected in 1986 on Mount Lemmon in Arizona at an altitude of 3,000 meters. For research in the submillimeter range of cosmic radio waves the reflectors must have extremely high contour accuracies under all environmental conditions. Such degrees of accuracy are not attainable with conventional structural materials such as steel and aluminum. B.W.

N85-18227# Joint Publications Research Service, Arlington, Va.
OPTICAL COMPUTER STUDIES AT UK'S HERIOT-WATT UNIVERSITY **c60**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 12-13 Transl. into ENGLISH from Wirtschaftswoche (Dusseldorf), 2 Nov. 1984 p 96; 98 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

Up to the present it has not been possible to incorporate semiconductor lasers into the glass fibers in such a way that, upon being reached by weak incoming light impulses, they emit strong new flashes. But work is proceeding in the laboratories to trigger switching procedures directly with light impulses. The development of optical computers by scientists at the Heriot-Watt University is described. Laboratory models of optical connector

switches which process data with light impulses in a way which otherwise occurs in electronic elements are also described. The basic principle of the optical switch is a bi-stable effect in crystals which, depending on the intensity of the controlling ray of light, are more or less translucent and remain in the state thus assumed, whereby they indicate the values zero or one of the universal binary number system of all computers. They are therefore able to store data and, in combination with others, form gate circuits and finally arithmetic units for data processing. B.W.

N85-18228# Joint Publications Research Service, Arlington, Va.
DUTCH INSTITUTES DO RESEARCH IN TACTILE VISUAL ROBOT SENSORS **c37**
G. A. Schwippert and G. K. Steenvoorden *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 14-17 Transl. into ENGLISH from TNO Proj. (The Hague), Sep. 1984 p 340-342 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

The value of being able to perceive objects and conditions optically has been recognized for a long time. A Center for Image Processing has been set up in Delft where the Technical Physical Service TNO-TH (TPD), the Technical Physics division and the Electrotechnology division of the Delft Technical College cooperate in the broad area of image processing. The sensor being used is a television camera or a so-called solid state camera (a camera which operates with a semiconductor as reading element). The images are divided into picture dots (pixels) and the gray scale value (an intensity value between light and dark) or a dot is determined. If more continuous information is described, then a PSD [Position Sensitive Device], a silicon sensor based on the lateral photodiode effect (the effect whereby the photocurrent is divided horizontally over the sensor) can be used. The characteristics and implementation possibilities of the PSD are described. B.W.

N85-18229# Joint Publications Research Service, Arlington, Va.
SCANIA, ASEA OF SWEDEN USE ROBOTS FOR ALL PRODUCTION PHASES **c37**
Peter R. Muehlemann *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 18-26 refs Transl. into ENGLISH from Tech. Rundschau (Bern), 18 Sep. 1984 p 25; 27; 29 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

In Sweden the industrial robot is not only an important factor in its application; the production of robots also has an important place. Worldwide the standard production of industrial robots makes up three percent of the standard machine tool production. In Sweden this value already lies at about 40 percent. Worldwide Sweden produces about nine percent of the industrial robots, while the comparable value for machine tools is only about one percent. The use of industrial robots in various production environment is detailed. B.W.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-18230 Communications Research Centre, Ottawa (Ontario). Space Technology and Application Branch.
SUBJECTIVE EVALUATION OF THE EFFECT OF NOISE AND INTERFERENCE ON FREQUENCY MODULATED NTSC TELEVISION SIGNALS
M. Bouchard, G. Chouinard, and R. Trenholm Dec. 1984 123 p refs
(CRC-1367) Avail: Issuing Activity

The future environment of broadcasting satellites may well be governed by the limiting factor of interference between television signals from neighboring satellites. A program of tests was performed to evaluate subjectively the effect of aggregate interference and/or noise on the impairment of television pictures. Up to four interfering channels were added in an environment resembling that of future broadcasting satellite systems including up to two co-frequency channels and up to two adjacent channels. Also results of just-perceptible interference tests due to adjacent channel interferer at various intercarrier spacings and for different receive filter characteristics on the wanted signal path are presented. The results of these tests are considered valuable in the study of the quality standard for the RARC-83 for the planning of the broadcasting-satellite service. Author

N85-18231 Communications Research Centre, Ottawa (Ontario). Mobile Studies Group.
PROPAGATION MEASUREMENTS FOR LAND-MOBILE SATELLITE SERVICES IN THE 800 MHz BAND
J. S. Butterworth Aug. 1984 49 p refs
(CRC-TN-724) Avail: Issuing Activity

Excessive path loss in suburban and rural areas was examined. Measurements of deciduous foliage attenuation gave a value of 0.29 dB per meter of foliage depth. At a source elevation angle of 15 to 20 degrees the mean signal attenuation in shadowed locations was 7 dB, with less than 10.4 dB at 95% of the locations in the test area. Measurements of fading statistics in unshadowed locations, using a conical log-spiral antenna, showed the diffuse multipath signals to be typically 11 dB below the direct component. Measurements of the combined effects of fading and shadowing over 50 km of rural roads showed that excess-loss margins above minimum quality of about 14 dB would be required to provide service to 99% of the locations at 20 deg elevation angle. At 15 deg a margin of about 20 dB would be required. B.G.

N85-18232 Communications Research Centre, Ottawa (Ontario). Mobile Studies Group.
PROPAGATION MEASUREMENTS FOR LAND-MOBILE SATELLITE SYSTEMS AT 1541 MHz
J. S. Butterworth Aug. 1984 33 p refs
(CRC-TN-723) Avail: Issuing Activity

A measurement program was undertaken with the objective of providing engineering design data on excess path-loss for potential land-mobile satellite systems operating in the 1500 MHz band. In the suburban and rural areas which could be served by such a system, fading due to multipath propagation and shadowing by terrain obstacles were the two phenomena characterized. Using an omni-azimuth vehicle antenna to receive a signal at 20 degrees elevation from the MARECS A satellite, the diffuse multipath signals were found to be 10 dB less than the direct component. The percentage of shadowed locations on the test routes varied from 5% in open farmland to 33% in suburban locations. The corresponding signal margins required to provide 99% coverage over the various test routes ranged from 12 dB to 21 dB. Author

N85-18233 British Broadcasting Corp., Kingswood (England). Engineering Div.
DIGITAL SOUND: PROGRAMME-MODULATED NOISE LEVELS IN SOUND SIGNALS SUBJECTED TO A NUMBER OF DIGITAL COMPANDING PROCESSES
N. H. C. Gilchrist Nov. 1984 16 p refs
(BBC-RD-1984/11) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

When a sound signal is companded (i.e., compressed and expanded) program-modulated noise is added. The levels of program-modulated quantizing noise which accompany a sound signal after it has been subjected to a number of digital companding processes were determined along with the extent to which sound signals are impaired by different combinations of the BBC NICAM-3 and the two types of A-law companding systems. The conclusions drawn are that the program-modulated noise introduced by a sound-program connection comprising two or more different digital companding systems with digital interconnections between the systems is at a level determined by one of the A-law processes. When further compandors of a type already present are added to

a connection comprising a single companding system or a number of companding systems, there is little or no increase in the level of program-modulated quantizing noise. R.S.F.

N85-18234 British Broadcasting Corp., Kingswood (England). Engineering Div.
THE SUSCEPTIBILITY OF AERONAUTICAL NAVIGATIONAL AIDS TO INTERFERENCE FROM ADJACENT-BAND BROADCAST TRANSMISSIONS
G. H. Millard Nov. 1984 18 p refs
(BBC-RD-1984/12) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

Measurements to determine the susceptibility of some airborne navigation receivers to interference from VHF/FM sound transmissions are described. The measurements were designed to investigate both the response to interference radiated in-band and to intermodulation in the receivers. R.S.F.

N85-18235 University of Central Florida, Orlando.
AWQPSK: AN OPTIMUM MODULATION TECHNIQUE FOR SPREAD SPECTRUM COMMUNICATION Ph.D. Thesis
Madjid A. Belkerdid 1984 84 p
Avail: Univ. Microfilms Order No. DA8425268

Quadrature phase shift keying (QPSK) and minimum shift keying (MSK) are the two most used M-ary modulation techniques in direct sequence (DS) spread spectrum communication systems. A modulation technique is introduced that can compete well with QPSK and MSK in many applications. This new modulation technique made up of a superposition of one QPSK signal and two amplitude weighted QPSK signals, is called amplitude weighted quadrature phase shift keying (AWQPSK). It is found to have the same probability of error as QPSK and MSK techniques. It has a higher bandwidth efficiency in bits/sec/Hz than QPSK and MSK. It has 99.99 percent of its energy within the bandwidth and its sidelobes are 63 db down from the main lobe. Intersymbol interference (ISI) was simulated on an HP 9845 computer and was shown to be smaller than the ISI in a QPSK or an MSK signal. Two different implementation schemes are presented.
Dissert. Abstr.

N85-18236 Missouri Univ., Columbia.
RADIATION PATTERNS OF A PYRAMIDAL HORN ANTENNA Ph.D. Thesis
Michael Stewart Noonan 1984 124 p
Avail: Univ. Microfilms Order No. DA8425644

The theory of the far-field radiation pattern of a pyramidal horn antenna is presented. Methods to determine the theoretical radiation pattern of a pyramidal horn antenna include the following: (1) rigorous analysis; (2) aperture methods; (3) equivalence principles; (4) quasi-pyramidal or spherical sector horn approximations; and (5) edge diffraction techniques. Theoretical calculations are compared with experimental measurements for two pyramidal horn antennas. Approximations, assumptions and other sources of error are listed and discussed. Dissert. Abstr.

N85-18237 Georgia Inst. of Tech., Atlanta.
REAL-TIME ESTIMATION OF AMPLITUDE AND GROUP DELAY DISTORTION IN A PSK LINE-OF-SIGHT COMMUNICATIONS CHANNEL Ph.D. Thesis
Glenn Eugene Prescott 1984 171 p
Avail: Univ. Microfilms Order No. DA8425183

Linear transmission distortion is a malady which is common to communication transmission systems of all types. Compensating for--or equalizing--this form of distortion is essential in order to realize the maximum possible error-free transmission of information. An on-line technique for estimating linear transmission distortion parameters which are common to narrow band line-of-sight terrestrial microwave communication systems employing M-ary PSK modulation will be developed. The parameters of interest are represented as coefficients of a polynomial channel model in order to indicate the degree of amplitude and group delay distortion present in the channel. Dissert. Abstr.

N85-18238*# General Electric Co., Syracuse, N.Y. Electronics Lab.
CONFIGURATION STUDY FOR A 30 GHz MONOLITHIC RECEIVE ARRAY: TECHNICAL ASSESSMENT
W. H. Nester, Bryan Cleaveland, Brian Edward, Steve Gotkis, Gary Hesserbacker, Jack Loh, and Bruce Mitchell 1 Nov. 1984 47 p refs 3 Vol.
(Contract NAS3-23780)
(NASA-CR-174697; NAS 1.26:174697) Avail: NTIS HC A03/MF A01 CSCL 17B

The current status of monolithic microwave integrated circuits (MMICs) in phased array feeds is discussed from the point of view of cost performance, reliability, and design considerations. Transitions to MMICs, compatible antenna radiating elements and reliability considerations are addressed. Hybrid antennas, feed array antenna technology, and offset reflectors versus phased arrays are examined. A.R.H.

N85-18239*# General Electric Co., Syracuse, N.Y. Electronics Lab.
CONFIGURATION STUDY FOR A 30 GHz MONOLITHIC RECEIVE ARRAY, VOLUME 1
W. H. Nester, Bryan Cleaveland, Brian Edward, Steve Gotkis, Gary Hesserbacker, Jack Loh, and Bruce Mitchell 1 Nov. 1984 181 p refs 3 Vol.
(Contract NAS3-23780)
(NASA-CR-174697-Vol-1; NAS 1.26:174697-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 17B

Gregorian, Cassegrain, and single reflector systems were analyzed in configuration studies for communications satellite receive antennas. Parametric design and performance curves were generated. A preliminary design of each reflector/feed system was derived including radiating elements, beam-former network, beamsteering system, and MMIC module architecture. Performance estimates and component requirements were developed for each design. A recommended design was selected for both the scanning beam and the fixed beam case. Detailed design and performance analysis results are presented for the selected Cassegrain configurations. The final design point is characterized in detail and performance measures evaluated in terms of gain, sidelobe level, noise figure, carrier-to-interference ratio, prime power, and beamsteering. The effects of mutual coupling and excitation errors (including phase and amplitude quantization errors) are evaluated. Mechanical assembly drawings are given for the final design point. Thermal design requirements are addressed in the mechanical design. A.R.H.

N85-18240*# General Electric Co., Syracuse, N.Y. Electronics Lab.
CONFIGURATION STUDY FOR A 30 GHz MONOLITHIC RECEIVE ARRAY, VOLUME 2
W. H. Nester, Bryan Cleaveland, Brian Edward, Steve Gotkis, Gary Hesserbacker, Jack Loh, and Bruce Mitchell 1 Nov. 1984 375 p 3 Vol.
(Contract NAS3-23780)
(NASA-CR-174697-Vol-2; NAS 1.26:174697-Vol-2) Avail: NTIS HC A16/MF A01 CSCL 17B

The formalism of the sidelobe suppression algorithm and the method used to calculate the system noise figure for a 30 GHz monolithic receive array are presented. Results of array element weight determination and performance studies of a Gregorian aperture image system are also given. A.R.H.

N85-18241# BDM Corp., McLean, Va.
ELECTROMAGNETIC PROCESSING OF MATERIALS Technical Report, 6 Feb. - 17 Aug. 1984
G. B. Taggart 17 Aug. 1984 89 p
(Contract MDA903-84-C-0039; DARPA Order 4114)
(AD-A148804; BDM/W-84-0527-TR) Avail: NTIS HC A05/MF A01 CSCL 13/8

This report examines the potential for using electromagnetic radiation (microwaves) in the processing of materials. The feasibility of enhancing the coupling of incident microwave energy for

materials processing is investigated with emphasis on ordinarily low-loss materials, e.g., polymers. A review is made of the coupling of electromagnetic radiation to nonconductive solids. The mechanisms for coupling microwaves to these solids are identified and variables which can influence dielectric loss are reviewed. A survey of the literature on microwave processing of materials is given. Finally, a discussion is presented on modifying materials so as to enhance coupling. GRA

N85-18242# Army Military Personnel Center, Alexandria, Va.
STAR ON THE HORIZON: THE EMERGENCE OF THE DIRECT BROADCAST SATELLITE IN AMERICAN MASS COMMUNICATIONS M.S. Thesis
J. H. Thomas 21 Dec. 1984 114 p
(AD-A148819; AD-E700011) Avail: NTIS HC A06/MF A01 CSCL 17/2

The purpose of this thesis is to describe the concept of broadcasting from satellites directly to the viewer equipped with a small, inexpensive receiving antenna, and the evolution of this technology as a means of commercial broadcast. Emphasis is placed on the problems of developing a regulatory framework for DBS by the Federal Communications Commission. The opposition of the existing broadcasters to the unregulated development of direct broadcast satellite (DBS) is explored in light of the possible effect that DBS may have on the economic base, audience, and advertising revenue of existing broadcasters. The information for this study was obtained from government documents, legal journals, books and the popular press. Two basic conclusions are drawn from this study: First, that the existing broadcasters have opposed the marketplace development of DBS, and second, that DBS does not pose as great a threat, at least in the near term, as the broadcasters fear. Author (GRA)

N85-18243# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EVALUATION OF PARAMETERS OF A SIGNAL (SELECTED PAGES)
S. Y. Falkovich 20 Nov. 1984 170 p Transl. into ENGLISH from mono. "Otsenka Parametrov Signala" Moscow, Sovetskoye Radio, 1970 p 36-104, 179-199, 322-334
(AD-A148831; FTD-ID(RS)T-1502-84) Copyright. Avail: NTIS HC A08/MF A01 CSCL 17/2

Optimum methods of radio reception are discussed from a theoretical standpoint. Signal discrimination is mentioned along with compression of radiation patterns. Statistical theory is emphasized herein. R.S.F.

N85-18244# Zaininger Engineering Co., San Jose, Calif.
ELECTROMAGNETIC PULSE (EMP) INTERACTION WITH ELECTRIC POWER SYSTEMS. POWER SYSTEMS TECHNOLOGY PROGRAM Final Report
H. W. Zaininger Aug. 1984 164 p refs
(Contract DE-AC05-84OR-21400)
(DE85-000166; ORNL/Sub-82-47905/1) Avail: NTIS HC A08/MF A01

A high altitude nuclear burst, detonated at a height of 50 km or more, causes two types of electromagnetic pulses (EMP), high altitude EMP (HEMP) and magnetohydrodynamic EMP (MHD-EMP). This high altitude EMP scenario is of principal concern when assessing the effects of EMP on electric power systems, because the total United States can be simultaneously illuminated by HEMP and MHD-EMP can cover a large area of up to several hundred kilometers in diameter. Typical electrical power system characteristics for EMP analysis are defined. Reasonable worst case EMP induced surges on overhead electric power system transmission and distribution lines for reasonable assumptions, using unclassified HEMP and MHD-EMP electric field waveforms are determined. DOE

N85-18245# Argonne National Lab., Ill.
STATUS OF RF SUPERCONDUCTIVITY AT ARGONNE NATIONAL LABORATORY
K. W. Shepard 1984 16 p refs Presented at 2nd Workshop on RF Superconductivity, Geneva, 23 Jul. 1984
(Contract W-31-109-eng-38)
(DE85-002145; CONF-840790-3) Avail: NTIS HC A02/MF A01

Work on RF superconductivity focussed on the development of superconducting structures for acceleration of heavy ions. This work resulted in the development of several niobium split ring resonators for the acceleration of particles of velocity $.04 < v/c < .2c$, construction and operation since 1979 of a superconducting booster linac based on these resonators, and the expansion of the booster into the Argonne tandem linac accelerating system (ATLAS) - a national facility for nuclear structure research. The resonators developed for the Argonne superconducting heavy ion linac are described along with the accelerator facility and its operational characteristics. Finally, current resonator development is discussed, together with implications for future upgrading of the ATLAS facility. DOE

N85-18246# European Space Agency, Paris (France).
PULSE HETERODYNE EQUIPMENT FOR MEASUREMENTS OF RANGE AND VELOCITY OF MOVING TARGETS-PULSE RADAR
Friedrich Malota Jul. 1984 45 p refs Transl. into ENGLISH of "Impuls-Heterodynanlage zur Entfernungs- u. Geschwindigkeitsmessung von bewegten Zielen" Rept. DFVLR-FB-83-18 DFVLR, Oberpfaffenhofen, West Germany, Mar. 1983 Original language document announced as N84-19696
(ESA-TT-845; DFVLR-FB-83-18) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 18,50

A pulse heterodyne equipment comprising a transmitter with pulse length of 300 nsec and a continuous wave local oscillator was developed. Angular sensitivity and frequency behavior measurements were carried out. About 100 rangefinding measurements were performed, and it is shown that the accuracy increases with higher intermediate frequencies. The influence of the velocity of moving targets was simulated by a rotary disk. Results show that this influence diminishes with higher intermediate frequencies. Author (ESA)

N85-18247# Fondazione Ugo Bordoni, Rome (Italy).
CALCULATION OF THE AREA COVERED BY MOBILE RADIO SYSTEMS USING GEOGRAPHIC DATA STORED IN A COMPUTER [CALCOLO DELLA COPERTURA DI SISTEMI RADIOMOBILI MEDIANTE DATI GEOGRAFICO MEMORIZZATI SU CALCOLATORE]
S. Bonora (Fondazione G. Marconi), G. Falciasecca (Bologna Univ.), and M. Frullone Dec. 1983 90 p refs In ITALIAN Sponsored by Italian Amministrazione P.T.
(FUB-43-1983) Avail: NTIS HC A05/MF A01

The algorithms to determine the areas covered by a mobile radio system and the interference areas are studied. The electromagnetic field intensity is predicted using stored orographic data. A prediction model in which the environmental conditions of the receiving vehicle are taken into consideration is described. A geographic data base is necessary to evaluate the field intensity. The output is a statistical distribution of the reception conditions. Author (ESA)

N85-18248# Fondazione Ugo Bordoni, Rome (Italy).
VOICE DATA PROCESSING IN PACKET SWITCHING MODES [TRATTAMENTO DELLA VOCE IN NODI A COMMUTAZIONE DI PACCHETTO]
Davide Grillo, Marco Listanti, Germano Tartaruga, and Francesco Villani Oct. 1983 34 p refs In ITALIAN Sponsored by Italian Amministrazione P.T.
(FUB-44-1983) Avail: NTIS HC A03/MF A01

A dynamic reduction of redundancy of voice data in packet switching networks is discussed. The goal is to reduce the transport delay in momentary network congestion situations by means of a lower redundancy of voice signals, preserved by the adoption of adequate coding rates. The analysis shows that the average delay and its dispersion are lower using the proposed

procedure. The procedure does not require any exchange of information between nodes. Author (ESA)

N85-18249# Fondazione Ugo Bordoni, Rome (Italy).
ANALYSIS OF THE PERFORMANCE OF MULTIACCESS NETWORKS OF THE BUS TYPE [ANALISI DI PRESTAZIONI DI RETI MULTIACCESSO DI TIPO BUS]
Marco Listanti (Rome Univ.) and Achille Pattavina Dec. 1983 28 p refs In ITALIAN Sponsored by Italian Ist. Superiore P.T.
(FUB-47-1983) Avail: NTIS HC A03/MF A01

Problems related to delay and throughput of multiaccess networks are examined. The effect of transmitting variable length packets on network throughput are analyzed. The delay is evaluated as a function of the average number of retransmissions to which each packet is subjected. Non persistant, one persistant and p persistant protocols are examined finding that the results are reversed with growing traffic density for non persistant and one persistant protocols, while p persistant protocols keep an intermediate efficiency. Author (ESA)

N85-18250# Fondazione Ugo Bordoni, Rome (Italy).
A PUBLIC KEY CRYPTOGRAPHIC ALGORITHM BASED ON A GENERALIZATION OF THE KNAPSACK PROBLEM [UN ALGORITMO CRITTOGRAFICO A CHIAVE PUBBLICA BASATO SU UNA GENERALIZZAZIONE DEL PROBLEMA DEL KNAPSACK]
Adina DiPorto Jun. 1984 13 p refs In ITALIAN Sponsored by Italian Amministrazione P.T.
(FUB-7-1984) Avail: NTIS HC A02/MF A01

A double key cryptographic algorithm is presented. The algorithm allows signal encoding with multivalued alphabets, while the classical knapsack method codes binary messages only. Cryptographic robustness is shown by an example where the random decodification of a message using a 32 symbol alphabet would take >10,000 yr. Author (ESA)

N85-18251# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
SPEECH ANALYSIS BY PARAMETRIC METHODS: A SURVEY
Claude Gueguen 1984 35 p refs In FRENCH; ENGLISH summary Submitted for publication
(ENST-84C004; ISSN-0751-1337) Avail: NTIS HC A03/MF A01

Speech analysis parametric modeling and parameter extraction methods are summarized. Linear prediction principles and associated fast algorithms are reviewed. Global analysis methods on short time windows, with variable frequency resolution, and additive noise; time evolving methods where a time varying parametric model is adjusted to model the transitions between quasistationary periods; and time adaptive sequential methods using fast algorithms along with a synchronous detection of temporal events are examined. Author (ESA)

N85-18252# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
MULTIVARIABLE AUTOREGRESSIVE MOVING AVERAGE (ARMA) MODELS: A TIME APPROACH TO ANTENNA PROCESSING Ph.D. Thesis [LES MODELES ARMA MULTIVARIABLES: UNE APPROCHE TEMPORELLE AU TRAITEMENT D'ANTENNE]
Menad Sidahmed 11 Sep. 1984 202 p refs In FRENCH
(ENST-84E015; ISSN-0751-1353) Avail: NTIS HC A10/MF A01

Parametric modeling techniques of autoregressive moving average (ARMA) type for analyzing broadband continuous spectrum antenna and image signals without passing by the frequency domain were derived. It is shown that a vectorial autoregressive can be used to estimate omnidirectional noise at detectors and to evaluate the number of broadband sources. Separate modeling of sources in the propagation medium enabled a model for deriving source parameters (azimuth, spectrum) to be obtained. Author (ESA)

N85-18253# Uppsala Ionospheric Observatory (Sweden).
STANDING WAVE PATTERN OF HF RADIO WAVES IN THE IONOSPHERIC REFLECTION REGION. PART 1: GENERAL FORMULAS
Bengt Lundborg and Bo Thide 3 Oct. 1984 26 p refs
(UIO-SR-84-05-Pt-1; ISSN-0349-2699) Avail: NTIS HC A03/MF A01

Formulas for computing the field strength near the reflection point of an electromagnetic wave impinging vertically upon a horizontally stratified ionosphere are derived by a uniform approximation valid throughout the whole reflection region. Smoothly varying profiles of general shape but with the gross features determined by the presence of one or two transition points are assumed. Coupling and nonlinear effects are not explicitly included. The formulas can be used to calculate the field structure of HF radio waves transmitted into the ionosphere and to calculate the swelling of reflected waves. Author (ESA)

N85-18254# National Telecommunications and Information Administration, Annapolis, Md.
MEASUREMENT PROCEDURES FOR THE RADAR SPECTRUM ENGINEERING CRITERIA
John J. Sell Aug. 1984 101 p
(PB85-119022/GAR; NTIA/Rept-84-157) Avail: NTIS HC A06/MF A01 CSCL 17B

Test procedure(s) are given for each of the equipment parameters covered by the RSEC that should yield adequate measured data for checking against the RSEC. Topics covered include: transmitters, antennas, receivers, tunability, frequency stability, pulse shape, and emission spectra. GRA

N85-18255# Institute for Telecommunication Sciences, Boulder, Colo.
STUDY OF FACTORS AFFECTING AN HF/VHF DIRECT BROADCASTING SATELLITE SERVICE
C. Rush, J. Aarons, F. Stewart, J. Klobuchar, P. Doherty, M. PoKempner, and R. Reasoner Sep. 1984 150 p refs
(PB85-120889/GAR; NTIA-Rept-84-158) Avail: NTIS HC A07/MF A01 CSCL 17B

The Institute for Telecommunication Sciences has undertaken an assessment of the link margin required for the satisfactory performance of a direct broadcasting satellite service operating in the high frequency (HF) and in the very high frequency (VHF) bands. The assessment involved the determination of a number of issues relating to performance of HF and VHF satellite-based transmission systems. These issues included determining under what conditions a frequency allocated to the broadcasting service can be expected to reach the surface of the Earth from a satellite, the loss of signal strength due to passage through the ionosphere, the impact of sporadic E and ionospheric ducting, the effect of scintillation on broadcast performance, the impact of Faraday rotation on system design, and the possibility of a satellite-based broadcasting service interfering with existing ground-based services. Author (GRA)

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-18256 Texas Univ., Austin.
DISTRIBUTED ENERGY STORE RAILGUNS EXPERIMENT AND ANALYSIS Ph.D. Thesis
Leo Daniel Holland 1984 351 p
Avail: Univ. Microfilms Order No. DA8421722

Electromagnetic acceleration of projectiles holds the potential for achieving higher velocities than yet achieved by any other means. A railgun is the simplest form of electromagnetic macroparticle accelerator and can generate the highest sustained accelerating force. The practical length of conventional railguns is limited

by the impedance of the rails because current must be carried along the entire length of the rails. A railgun and power supply system called the distributed energy store railgun was proposed as a solution to this limitation. A distributed energy storage railgun was constructed and successfully operated. In addition to this demonstration of the distributed energy store railgun principle, a theoretical model of the system was also constructed. A simple simulation of the railgun system based on this model, but ignoring frictional drag, was compared with the experimental results. During the process of comparing results from the simulation and the experiment, the effect of significant frictional drag of the projectile on the sidewalls of the bore was observed.
Dissert. Abstr.

N85-18257 Ohio State Univ., Columbus.
NEURAL COMPENSATION, MUSCLE LOAD DISTRIBUTION AND MUSCLE FUNCTION IN CONTROL OF BIPED MODELS Ph.D. Thesis
Behnam Bavarian 1984 158 p
Avail: Univ. Microfilms Order No. DA8426352

Three aspects of the neuromuscular control of muscle actuators in biped movements were studied: neural compensation, muscle load distribution, and muscle function. A block diagram of a neural control circuit model of the control nervous system is presented. Based on this block diagram a circuit comprised of a dynamic compensator, an inverse plant, and pre-programmed reference trajectory generators is proposed for control of a general n-link biped model. This circuit is used to study the postural stability and point-to-point voluntary movement of a two-link planar biped with two pairs of muscle models. The muscle load distribution, relevant to functional electrical stimulation of paraplegic patients for restoration of limited motor function, is considered. A quantitative analysis of the local controllability of a two-link planar biped model incorporating six major muscles of the lower extremities is presented. A model of the muscle for the lower extremities is presented.
Dissert. Abstr.

N85-18258 Minnesota Univ., Minneapolis.
DEVICE MODELING FOR ADVANCED INTEGRATED CIRCUITS Ph.D. Thesis
Dong-Hyuk Ju 1984 132 p
Avail: Univ. Microfilms Order No. DA8424707

Exact solutions for semiconductor problems require, more often than not, the use of numerical methods. While a numerical solution offers precision, an approximate-analytic solution provides convenience and physical insight, thus the two approaches are complementary. Solving problems numerically has become increasingly popular because of the growing pervasiveness of computers, but there are still many cases wherein an approximate analytic approach is preferred. Approximate analytic models for inversion and accumulation layers are developed in the context of the general solution. Approximate-analytic modeling of the BJT and the MOSFET is described using these results, and using the depletion approximation replacement (DAR). A study of the 3-dimensional integrated circuit is also included. Specifically, the results of the investigations on the processing technology, device and circuit options for the all-semiconductor 3-D ICs are presented.
Dissert. Abstr.

N85-18259*# Massachusetts Inst. of Tech., Cambridge. Office of Sponsored Programs.
METAL VAPOR ARC SWITCH ELECTROMAGNETIC ACCELERATOR TECHNOLOGY Report, 3 Sep. 1983 - 2 Sep. 1984
Peter P. Mongeau Dec. 1984 60 p refs
(Grant NAG3-283)
(NASA-CR-174380; NAS 1.26:174380) Avail: NTIS HC A04/MF A01 CSCL 09A

A multielectrode device housed in an insulator vacuum vessel, the metal vapor vacuum switch has high power capability and can hold off voltages up to the 100 kilovolt level. Such switches can be electronically triggered and can interrupt or commutate at a zero current crossing. The physics of arc initiation, arc conduction, and interruption are examined, including material considerations; inefficiencies; arc modes; magnetic field effects; passive and forced extinction; and voltage recovery. Heating, electrode lifetime, device configuration, and external circuit configuration are discussed. The metal vapor vacuum switch is compared with SCRs, GTOs, spark gaps, ignitrons, and mechanical breakers.
A.R.H.

N85-18260# Department of Energy, Washington, D. C. Office of Inspector General.
THE PLANNED EXPANSION OF MICROELECTRONICS CAPABILITY AT SANDIA NATIONAL LABORATORY
14 Dec. 1984 95 p refs
(TI85-004326; DOE/IG-0213) Avail: NTIS HC A05/MF A01

The planned expansion of the microelectronics activities at Sandia National Laboratory, including the Radiation Hardened Integrated Circuit (RHIC) Laboratory Facility was inspected. The results are presented and discussed.
B.G.

N85-18261# Harry Diamond Labs., Adelphi, Md.
CALCULATIONS OF HIGH-CURRENT CHARACTERISTICS OF SILICON DIODES AT MICROWAVE FREQUENCIES
A. L. Ward Oct. 1984 26 p
(DA Proj. 1L1-62120-AH-25)
(AD-A147406; HDL-TR-2057) Avail: NTIS HC A03/MF A01 CSCL 09/1

Dynamic current/voltage characteristics are calculated for silicon diodes at microwave frequencies. Forward and reverse half cycles are studied separately. Little current flows unless the forward half period exceeds the carrier transit time; then, as the frequency decreases, the peak forward current increases essentially linearly with the half period, until the dc value is attained. Avalanche multiplication is noted in the forward direction at about one half of the reverse breakdown voltage. Below the reverse breakdown voltage, the current consists solely of the stored forward charge. Above the reverse breakdown voltage, the peak current has a maximum at a frequency which depends on the diode width and temperature.
Author (GRA)

N85-18262# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
IMPROVED MATERIALS AND PROCESSES OF DISPENSER CATHODES Final Report, 1 Apr. 1980 - 1 Apr. 1984
R. T. Longo, W. F. Sundquist, and E. A. Adler Wright-Patterson AFB, Ohio Air Force Wright Aeronautical Labs. Aug. 1984 168 p
(Contract F33615-80-C-5191)
(AD-A148810; EDD-W-09514; AFWAL-TR-84-4072) Avail: NTIS HC A08/MF A01 CSCL 09/1

Several process variables affecting the final electron emission properties of impregnated dispenser cathodes were investigated. In particular, the influence of billet porosity, impregnant composition and purity, and osmium-ruthenium coating were studied. Work function and cathode evaporation data were used to evaluate cathode performance and to formulate a model of cathode activation and emission. Results showed that sorted tungsten powder can be reproducibly fabricated into cathode billets. Billet porosity was observed to have the least effect on cathode performance. Use of the 4:1:1 aluminate mixture resulted in lower work functions than did use of the 5:3:2 mixture. Under similar drawout conditions, the coated cathodes showed superior emission relative to uncoated cathodes. In actual Pierce gun structures under accelerated life test, the influence of impregnated sulfur is clearly shown to reduce cathode performance.
GRA

N85-18263# Brookhaven National Lab., Upton, N. Y.
OPERATIONAL CHARACTERISTICS OF A 1000 MVA SUPERCONDUCTING POWER TRANSMISSION SYSTEM
R. A. Thomas 10 Sep. 1984 5 p refs Presented at the Appl. Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract DE-AC02-76CH-00016)
(DE85-000232; BNL-35210; CONF-840937-9) Avail: NTIS HC A02/MF A01

Over the last three years, the power transmission project at Brookhaven National Laboratory has been testing two flexible

superconducting cables for the transmission of ac electric power. These cables are each 115 m long and are rated at 80 kV, 4100 A single-phase for a power rating of 333 MVA - (1000 MVA, 138 kV, 3 phase). They have been operated over the range of 7 to 12 K in supercritical helium at 14 to 15 atm. The cables have been tested at currents and voltages above their ratings and have also been operated with no coolant flow to study the effects of loss of refrigeration on cable performance. The insights gained from the operation of the system over this extended period are presented. Finally, those areas are delineated which will require further research before this technology can be integrated into the US electrical power delivery system. DOE

N85-18264# Argonne National Lab., Ill.
STATUS OF THE LI-AL/FeS BATTERY MANUFACTURING TECHNOLOGY. AN EVALUATION FOR THE US ARMY, BELVOIR R AND D CENTER Final Report
A. A. Chilenskas, H. Shimotake, R. Malecha, J. Battles, W. Miller, N. P. Yao, R. Saltat, and R. Hudson Aug. 1984 31 p refs
(Contract W-31-109-eng-38)
(DE85-000776; ANL-84-23) Avail: NTIS HC A03/MF A01

Research and development work on rechargeable lithium/molten salt batteries, sponsored by the US Department of Energy, is under way at Argonne National Laboratory (ANL) and several industrial laboratories for the past decade. In 1978, a program for the US Army (Belvoir R and D Center) was initiated with ANL and Eagle-Picher Industries to ascertain the status and to aid the development of the manufacturing technology of the Li-Al/FeS battery as a power source for forklift trucks. A long lived cell, achieving greater than 1000 discharge cycles, was developed in the Army program and was used as a basis for a forklift truck battery design. The projected performance of the Li-Al/FeS battery showed a 200% increase in stored energy when compared with a lead acid battery of equal volume. DOE

N85-18265# Sandia Labs., Albuquerque, N. Mex.
TRANSIENT RESPONSE OF A SMALL-SIGNAL MICROWAVE GaAs FET TO X-RAYS
J. G. Castle, Jr., M. G. Armendariz, D. R. Smith (Kaman Sciences Corp.), and G. R. Schuster 21 Aug. 1984 9 p refs Presented at the 21st IEEE Ann. Conf. on Nucl. and Space Radiation Effects, Colorado Springs, 22 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE85-000066; SAND-84-0542C; CONF-840712-13) Avail: NTIS HC A02/MF A01

Microwave power output of a submicron-gate GaAs FET, containing no buffer layer, is observed to recover within one hundred nanoseconds after the X-ray pulse from a FEBETRON 705 source. The FET is formed by implanting ions into the substrate, grown with a liquid encapsulated Czochralski method and doped lightly with chromium. DOE

N85-18266# California Univ., Berkeley. Lawrence Berkeley Lab. Lighting Systems Research Group.
NEW LIGHTING TECHNOLOGIES, THEIR STATUS AND IMPACTS ON POWER DENSITIES
R. R. Verderber and F. M. Rubinstein Jul. 1984 11 p refs Presented at the Doing Better: Setting an Agenda for the Second Decade, Santa Cruz, Calif., 14-21 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000712; LBL-18114; CONF-840819-13; EEB-L-84-10) Avail: NTIS HC A02/MF A01

In the mid-70s, new products employing new technologies were developed that increased the efficacy of producing and distributing visible light. These included the high frequency operation of fluorescent lamps, replacement of incandescent light sources, and effective management of lighting. These technologies are described and their present status are discussed. Their impacts on energy use and on the quantity and quality of illumination is presented. It is shown that proposed lighting power densities of 1.5 watts per square foot for lighting can be realized. DOE

N85-18267# Sandia Labs., Albuquerque, N. Mex.
COMPILATION OF SANDIA PAPERS CONTRIBUTED TO THE 17TH IEEE PHOTOVOLTAIC SPECIALISTS CONFERENCE
E. L. Burgess, ed. Aug. 1984 148 p refs Conf. held in Orlando, Fla., 1 May 1984
(Contract DE-AC04-76DP-00789)
(DE84-017456; SAND-84-1167; CONF-840561) Avail: NTIS HC A07/MF A01

Various topics in photovoltaics are discussed. Solar cells, photovoltaic power supplies, power conditioning circuits, and minority carriers are among the topics considered. DOE

N85-18268# Sandia Labs., Albuquerque, N. Mex.
NBS FREQUENCY MEASUREMENT SYSTEM FROM A USER'S VIEWPOINT
S. R. Booker and M. C. Jones 1984 17 p refs Presented at Natl. Conf. of Standards Labs., Gaithersburg, Md., 1 Oct. 1984
(Contract DE-AC04-76DP-00789)
(DE84-016782; SAND-84-1806C; CONF-8410145-1) Avail: NTIS HC A02/MF A01

During 1983, the National Bureau of Standards announced the availability of a new Frequency Measurement Service for standard oscillators of high stability. Two standards laboratories at Sandia National Laboratories subscribed to that service, and as a result were supplied by the National Bureau of Standards with hardware, software, consultant, and a continuing program of standard oscillator evaluation. The motivation for subscribing to the new service, experience in setting up the systems at Sandia, system reliability, some preliminary observations about accuracy, and possible system enhancements are discussed. DOE

N85-18269# Argonne National Lab., Ill.
SUBCABLE TEST FACILITY
S. H. Kim Sep. 1984 3 p refs Presented at Applied Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract W-31-109-eng-38)
(DE85-002103; CONF-840937-5) Avail: NTIS HC A02/MF A01

A subcable test facility was prepared to study ac losses and stability of subsize cables under the pulsing magnetic field of a 40-kJ split pair coil. A G-10 cryostat fabricated for the system has an inner diameter of 31 cm and is 170 cm deep. An 80-kW power supply for the coil has a pulsing mode of triangular operation. Another 500-kW power supply, rated for dc operation at 400 V and 1250 A, can have pulsing modes of triangular, trapezoidal, or (B + B) superimposed. The ac losses of a superconducting composite strand with CuNi outer sheath were measured. Coupling losses among the strands were not significant because of the outer sheath. DOE

N85-18270# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF PHOTOCONDUCTIVE POWER SWITCH TECHNOLOGY Progress Report, 1 Jul. 1983 - 31 Mar. 1984
W. C. Nunnally, comp. Aug. 1984 20 p
(Contract W-7405-eng-36)
(DE85-001514; LA-10165-PR) Avail: NTIS HC A02/MF A01

This report describes the development of photoconductive power switch (PCPS) technology supported by the Air Force Weapons Laboratory (AFWI) during the last six months of CY 1983 and Los Alamos supporting research during the first six months of FY 1984. Carrier lifetime improvement, surface flashover reduction, uniform electric field geometries, and uniform optical illumination of the semiconductor surface are discussed. DOE

N85-18271# Michigan Technological Univ., Houghton. Dept. of Electrical Engineering.
ANALYSIS OF INVERTER MODELS AND HARMONIC PROPAGATION. PART 1: A PHYSICAL SIMULATOR FOR LARGE SOLAR CELL ARRAYS
M. A. Slonin, E. K. Stanek, and A. Imece Sep. 1984 125 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002312; SAND-83-7040-Pt-1) Avail: NTIS HC A06/MF A01

Part 1 of a three part study presents the experimental and

theoretical analysis of a physical simulator that simulates the output current voltage characteristics of large solar cell arrays. The simulator system is composed of a separately excited dc generator and a microcomputer based controller. The desired output characteristics of the solar cell arrays are obtained at the dc generator terminals by the control of the generator exciting current. The microcomputer generates a controlled error signal based on the simultaneous solution of the dc generator load equation and the analytical expression of the experimentally obtained solar cell characteristic. This controlled error signal changes the exciting current of the dc generator such that the output characteristics of the solar cell arrays are obtained. DOE

N85-18272# Stanford Linear Accelerator Center, Calif.
MULTIMODE HARMONIC POWER MEASUREMENT OF 40 MW PULSED S-BAND KLYSTRONS
W. R. Fowkes and E. S. Wu (Acad. Sinica, Peking) Aug. 1984 8 p refs Presented at the Conf. on Precision Electromagnetic Measurements, Delft, Netherlands, 20 Aug. 1984
(Contract DE-AC03-76SF-00515)
(DE85-001560; SU-SLAC-PUB-3396; CONF-8408108-1) Avail: NTIS HC A02/MF A01

An array of 12 calibrated RF electric field probes on the waveguide walls are used to sample the complex field profile at the second and third harmonics where the fundamental power is in the 40 MW range at 2856 MHz. The measured amplitude and phase signals from these are Fourier analyzed to determine with good accuracy the power in each of the many possible propagating modes. DOE

N85-18273# Bonneville Power Administration, Portland, Oreg. Communications Systems Branch.
SIGNAL HILL SOLAR-POWERED REPEATER REPORT AND RECOMMENDATIONS
Gregory R. Smith Aug. 1984 29 p
(DE85-000487; DOE/BP-326) Avail: NTIS HC A03/MF A01

The parially active repeater (PAR) discussed is the GTE Lenkurt 700C1 repeater. The 700C1 repeater is the first radio of its kind to operate in the 7/8 GHz frequency band. The 700C1's low power consumption makes it ideal to be powered by solar voltaic cells. A new PAR site costs substantially less to develop than a fully active repeater since less support equipment is needed, no a-c power has to be brought to the site, and the building can be as small as 6' x 6'. A prototype 700C1 solar powered repeater was installed to eventually replace the existing poor microwave path between Big Eddy Substation and Wasco Radio Station. The repeater's RF performance is better than BPA's original specifications. The solar panels did not generate power during the winter months, so additional solar panels were added in May 1982. The new microwave path between Wasco and Big Eddy, via Signal Hill, is a large improvement over the previous path, which was via a double passive repeater; noise levels were reduced and signal strength improved. E.A.K.

N85-18274# Cable Technology Labs., Inc., New Brunswick, N.J.
DETERMINATION OF THRESHOLD AND MAXIMUM OPERATING ELECTRIC STRESSES FOR SELECTED HIGH VOLTAGE INSULATION. TASK 3: INVESTIGATION OF HIGH VOLTAGE CAPACITOR INSULATION Progress Report
M. Sosnowski and G. S. Eager, Jr. Mar. 1984 45 p refs
(Contract DE-AC02-80RA-50156)
(DE84-017051; DOE/RA-50156/5; PR-4) Avail: NTIS HC A03/MF A01

The threshold voltage of capacitor insulation was investigated. The experimental work was performed on samples prepared from commercial polypropylene insulated, liquid-filled capacitors. The samples were vacuum-impregnated with the original capacitor insulating liquid obtained from the manufacturer. A limited number of full-size capacitor elements also were tested. Impulse voltage breakdown tests with dc voltage prestressing were performed at room temperature and 75 C. From the results of these tests, the threshold voltage of the samples of the capacitor insulation was determined at both temperatures and that of the whole capacitor elements at room temperature. The threshold voltage of the capacitor insulation was found to be approximately equal to the impulse breakdown voltage. No difference was found between the threshold voltage at room temperature and at 75 C. The threshold voltage of the whole capacitor elements at room temperature was found to be equal to approximately 80% of the threshold voltage of the capacitor insulation samples. DOE

N85-18275# Los Alamos Scientific Lab., N. Mex.
DESIGN AND OPERATING EXPERIENCE OF AN ac-dc POWER CONVERTER FOR A SUPERCONDUCTING MAGNETIC ENERGY STORAGE UNIT
H. J. Boenig, R. G. Nielsen, and K. H. Sueker 1984 8 p refs Presented at IEEE Industry Applications Soc. Meeting, Chicago, 1 Oct. 1984
(Contract W-7405-eng-36)
(DE84-014041; LA-UR-84-1949; CONF-8410100-1) Avail: NTIS HC A02/MF A01

The design philosophy and the operating behavior of a 5.5 kA, +-2.5 kV converter, being the electrical interface between a high voltage transmission system and a 30 MJ superconducting coil, are documented. Converter short circuit tests, load tests under various control conditions, dc breaker tests for magnet current interruption, and converter failure modes are described. DOE

N85-18276# General Electric Co., Schenectady, N. Y. Research and Development Center.
ADVANCED METAL OXIDE VARISTOR CONCEPTS Final Report
H. R. Philipp, G. D. Mahan, and L. M. Levinson Jul. 1984 77 p refs
(Contract DE-AC05-84OR-21400)
(DE84-016677; ORNL/Sub-84-17457/1) Avail: NTIS HC A05/MF A01

Zinc oxide varistors are ZnO-based ceramic semiconductor devices with highly nonlinear current-voltage characteristics similar to back-to-back Zener diodes but with much greater current, voltage, and energy-handling capabilities. Zinc oxide varistors have proven useful in a variety of applications, particularly as high-quality voltage suppression devices for the protection of ac and dc electric power transmission systems against the effects of transient overvoltages due to switching surges and lightning strikes. Simple varistor systems that use Bi or Pr as the varistor-forming additive and Co or Mn as the varistor-performance ingredient were studied. Commercial varistor materials generally use Bi as the varistor-forming ingredient, and the sintering process in such material probably proceeds in the liquid phase. Varistor materials that use Pr as the varistor-forming ingredient are also produced commercially. DOE

N85-18277# Sandia Labs., Albuquerque, N. Mex.
BATTERY RESPONSE TO PULSE LOADS: A MATHEMATICAL MODEL
F. M. Delnick and D. E. Amos Aug. 1984 27 p
(Contract DE-AC04-76DP-00789)
(DE85-001149; SAND-83-1770) Avail: NTIS HC A03/MF A01

A mathematical model is used to compute pulse load discharge profiles of cathode limited batteries. These discharges are characterized by 14 chemical and physical parameters. The total voltage loss within the battery is resolved into component contributions from ionic migration, capacitive relaxation, faradaic reaction, and diffusional mass transport limitations. A BASIC language computer program is supplied. DOE

N85-18401# Beijing Inst. of Strength and Environment Engineering (China).
A STUDY OF THE EFFECT OF MASS LOADING ON THE SHOCK ENVIRONMENT
Qi-Zheng Wang and Hua-Bao Lin *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 183-192 refs (For primary document see N85-18388 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-18278 Atomic Energy Establishment, Winfrith (England).
MEASUREMENT OF DROP-SIZE DISTRIBUTIONS WITH THE AID OF A SCATTERED LIGHT PARTICLE SIZE COUNTING ANALYSER
Claus-Detlef Schegk, Heinz Umhauer, and Friedrich Loeffler Oct. 1984 8 p refs Transl. into ENGLISH from Staub-Reinhalt-Luft (West Germany), v. 44, no. 6, Jun. 1984 p 264-267
(BLL-Trans-WH-620-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

For the experimental determination of drop size distributions produced by atomizer nozzles a special test apparatus was constructed. The measuring instrument employed was a further developed scattered-light particle size counting analyzer. This further development refers mainly to the correction of the boundary zone error which occurs with the usual devices based on this measuring principle. Since wide distributions were to be measured the range of measurement also had to be extended. The drop size distributions produced by atomizer nozzles differ locally in the spray beam. Using the example of the measurement results from a hollow-cone nozzle, this local dependence is explained and an indication given of the possibility of determining the overall distribution produced by the nozzle. Author

N85-18279 Atomic Energy Establishment, Winfrith (England).
APPLICATION OF SCATTERED LIGHT PARTICLE SIZE COUNTING ANALYSIS TO THE DETERMINATION OF WIDE DROP SIZE DISTRIBUTIONS
Meinz Umhauer and Claus-Detlef Schegk Oct. 1984 9 p refs Transl. into ENGLISH from Staub-Reinhalt-Luft (West Germany), v. 44, no. 5, 1984 p 226-228
(BLL-Trans-WH-619-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Among the scattered-light methods of measurement which are suitable for the determination of drop size distributions the counting methods are distinguished for their good resolution capability. At the same time the extent of the range of measurement of the counting methods is relatively small, so that wide distributions, such as are for the most part present in the case of drop collectives produced by atomizer nozzles cannot be completely comprehended. It is shown that on the assumption of steady distribution properties, it is possible to determine the complete drop size distribution of the given collective by carrying out two partial measurements in sequence in adjacent measurement ranges and combining correctly quantitatively the two partial results for the desired overall distribution. Two examples from a number of measurements show that with suitable choice of intersection points the method described leads to satisfactory results. The examples involve the size distribution of the drops from an ultrasonic atomizer and a hollow-cone nozzle. Author

N85-18280 Texas Univ., Austin.
MICROSCOPIC STUDY OF FLUID FLOW Ph.D. Thesis
Wayne Carlos Hendrickson 1984 191 p
Avail: Univ. Microfilms Order No. DA8421719

A numerical technique for the study of fluid flow is developed which is particularly well adapted for the study of dilute gases. The systems studied were limited to two-dimensions and divided into a grid of rectangular cells. Each cell is assigned a velocity spectrum constructed by specifying the probabilities that a molecule will have a particular speed and direction of motion. A basic time step is chosen such that there is a high probability that has a substantial fraction of the population will suffer a collision in that time, but not so long that large changes in a cell's spectrum occur. Two different geometries of flow are studied: (1) straight-channel flow, and (2) channel flow with a construction. The quality of the solution is monitored by following the conservation of energy, the continuity, the entropy behavior, and the general nature of the calculated flows. Dissert. Abstr.

N85-18281 Illinois Univ., Urbana-Champaign.
AN EXPERIMENTAL STUDY OF SINGLE AND MULTIPLE TURBULENT BUOYANT JETS IN CROSSFLOW Ph.D. Thesis
Jim Leylek 1984 270 p
Avail: Univ. Microfilms Order No. DA8422115

The phenomenon of turbulent, buoyant jets in crossflow is a fundamental fluid mechanics problem with many application areas, including jets discharged from natural and mechanical draft cooling towers. Buoyant jets were studied for many years, and as a result there exists a large body of literature on this and other related topics. An extensive review of this literature showed that there was a need for an improved laboratory simulation technique and quantitative data on both single and multiple buoyant jets. A new buoyant jet simulation technique is developed which uses a vertically downward discharge of nitrogen gas into a wind tunnel with discharge temperature of the jet ranging between -30 C and -150 C. This technique is capable of simulating the puff-like nature of prototype cooling tower plumes as evidenced by flow visualization which is inherent in this method. A large body of data are reported for both single and multiple jets covering a wide range of parameters. Dissert. Abstr.

N85-18282 Georgia Inst. of Tech., Atlanta.
ANALYSIS OF SUDDEN EXPANSION FLOW IN A TWO-DIMENSIONAL DUCT WITH AND WITHOUT SIDE-WALL INJECTION USING THE k-EPSILON TURBULENCE MODEL Ph.D. Thesis
Johnny C. R. Richardson 1984 356 p
Avail: Univ. Microfilms Order No. DA8424628

Cold flow modeling of the solid fuel ramjet combustor flow field was carried out by numerical analysis. An incompressible, two dimensional turbulent backward facing step flow with and without gas injection through the step inside wall was used to simulate the combustor flow. Mean velocities, pressure turbulence kinetic energy, energy dissipation rate, mean concentrations of the injected species and the time averaged turbulent fluctuations of the concentrations were calculated. The Reynolds stresses were derived from the predictions. For the gas injection case, three gases were considered. A range of uniform injection rates were used in the analysis. The predictions by the TEACH-GT code of the flow field without gas injection were compared with three different sets of experimental data. Reattachment length, mean velocities, turbulence intensities, and Reynolds stresses were the variables used for comparisons. Dissert. Abstr.

N85-18283 Pittsburgh Univ., Pa.
INVESTIGATION OF CONDENSING, THREE-PHASE, TWO-COMPONENT, FLOW THROUGH POROUS MEDIA Ph.D. Thesis
James B. Black 1983 222 p
Avail: Univ. Microfilms Order No. DA8422967

The supply of light, easily recoverable crude oil is rapidly being depleted, necessitating development of processes to recover the remaining heavy and residual crudes. To design efficient thermal recovery processes, it is necessary to understand the mechanisms associated with nonisothermal, transient, multiphase flow through porous media. Steam injection into a two-dimensional sand, saturated with water and oil at the irreducible water saturation was investigated. Relative-permeability data for this specific fluid-sand system were measured and used for input to the numerical simulator. The effect of steam injection rate and relative orientation of gravitational and viscous forces were studied. Since simulated results are extremely sensitive to changes in relative permeability, water-oil and oil-steam relative permeability was

measured for the specific fluid-sand system. The numerical simulator written for the project uses a finite difference technique. A comparison of experimental and simulated results show simulated oil production is consistently high. Dissert. Abstr.

N85-18284 Arizona Univ., Tucson.
NUMERICAL PREDICTIONS FOR UNSTEADY VISCOUS FLOW PAST AN ARRAY OF CYLINDERS Ph.D Thesis
Edward Andrew Cerutti 1984 179 p
Avail: Univ. Microfilms Order No. DA8424917

The unsteady two dimensional flow around an array of circular cylinders submerged in a uniform onset flow is analyzed. The Biot-Savart law of induced velocities is used to determine the velocity field due to the free vorticity in the surrounding fluid and the bound vorticity distributed on the surface of each cylinder which is governed by a Fredholm integral equation of the second kind. The transport of free vorticity in the flow field is governed by the vorticity transport equation which is discretized for a control volume and is solved numerically. Three cases for Reynolds numbers of 100, 1,000, and 10,000 are presented for the array of cylinders. The center to center distance is fixed at three diameters. The time development of constant vorticity contours as well as drag, lift, and moment coefficients are shown for each Reynolds number. The motion of stagnation and separation points with time is also given. It is found that the drag for a cylinder in the array may be as low as five percent of that for flow over a single cylinder at the same Reynolds number. Dissert. Abstr.

N85-18285 Minnesota Univ., Minneapolis.
CONVECTIVE HEAT TRANSFER COEFFICIENTS FOR PIPE FLOW WITH CURVATURE INDUCED SECONDARY MOTION Ph.D. Thesis
Gregory Martin Chrysler 1984 240 p
Avail: Univ. Microfilms Order No. DA8424678

Experiments were performed to study the turbulent heat transfer, pressure distribution, and fluid flow in a circular cross-section bend with a radius ratio of nine. Three bend angles, 30, 60, and 90 degress, were investigated. The flow condition to the bend inlet was established either by a long hydrodynamic development tube or a sharp-edge inlet. Quasi-local values of the heat transfer coefficient were obtained over five-degrees intervals, separately at the inner and at the outer walls of each bend. Strikingly different results were obtained, depending on the inlet condition to the bend. With the flow development tube in place, a region of high wall shear immediately downstream of the bend inlet was seen to be skewed toward the inner wall. This contrasted with the reattachment and recirculation region created when the sharp-edge inlet formed the entrace to the bend; reattachment of the flow occurred only on the outer wall. Measurement of pressure in the upstream development tube revealed the precursive effect of the bend, thereby shedding light on the inflow boundary condition for computational work on bend flows. Dissert. Abstr.

N85-18286 Miami Univ., Coral Gables, Fla.
NUMERICAL INVESTIGATION OF PHASE CHANGE HEAT TRANSFER IN A HORIZONTAL CYLINDER INCLUDING EFFECTS OF NATURAL CONVECTION Ph.D. Thesis
El-Sayed El-Masry 1984 140 p
Avail: Univ. Microfilms Order No. DA8416293

The melting of phase change material (PCM), inside a horizontal cylinder with constant temperature boundary condition is characterized by three main features: (1) irregular, moving solid-liquid interface boundary; (2) movement of solid phase as a whole as melting occurs; and (3) natural convection in the liquid phase and conduction in the solid phase. Up till now there is no solution that takes into account all three characteristics. A numerical model for this problem which takes into consideration these characteristics was developed including subcooling effects. Co-ordinate transformation is used to generate fixed regular boundaries, such that a body-fitted grid system can be used in the numerical procedures. Using a finite difference formulation, the primitive variable equations of motion are solved simultaneously with the energy equation and moving boundary heat balance equation, for the melt region, and the heat conduction equation for the solid region. Dissert. Abstr.

N85-18287 Notre Dame Univ., Ind.
TURBULENT BOUYANT FLOW AND PRESSURE VARIATIONS AROUND A CIRCULAR CYLINDER IN A CROSS UNIFORM FLOW NEAR THE GROUND Ph.D. Thesis
Hong-Sen Kou 1984 247 p
Avail: Univ. Microfilms Order No. DA8425272

A numerical analysis is made to improve our physical understanding of the turbulent buoyant flow near a circular cylinder close to the ground and also to determine the corresponding pressure variations and oscillations at the cylinder surface. It is based on an upwind finite difference scheme to solve the governing equations with a combination of Cartesian and cylindrical coordinates. The model developed is then used to simulate the shear flow over an aircraft fuselage immersed in a nearby fire on the ground. The results in terms of the velocity, temperature, smoke concentration, and pressure fields are obtained over a range of parameters including the fire size, strength and location, the fuselage size and elevation, and the shear flow velocity and distribution. A major influence on the physical phenomenon is the relative strength of buoyant flow due to the fire as compared to that of the shear flow. Dissert. Abstr.

N85-18288 California Univ., Davis.
THE SENSITIVITY ANALYSIS IN k-EPSILON TURBULENCE MODELING APPLIED TO JET FLOWS Ph.D. Thesis
Farhad Raiszadeh 1984 175 p
Avail: Univ. Microfilms Order No. DA8425013

Sensitivity analysis was applied to the k epsilon turbulence model for flow of a round jet for two different physical situations: the incompressible round jet; and the variable density isothermal round jet. The effect of inherent uncertainties or variations in the empirical constants of the k epsilon turbulence model on the solution is studied. In the incompressible case, the results show that the modifications of the model are successful due to the conservation of momentum property of the round jet. In the variable density round jet, it was shown that the conservation of momentum property dominates the variable density jet flow as well; and there is no unique modification to the k epsilon model for jet flow. The results also show some very large sensitivities to the empirical coefficients in the epsilon equation. These large sensitivities do not seem to agree completely with what is known about jet turbulent structure and there is a need to improve the k epsilon model in this area. A general conclusion of the research is that sensitivity analysis is and can be a valuable tool in understanding complex turbulent transport. Dissert. Abstr.

N85-18289 British Aerospace Aircraft Group, Kingston-upon-Thames (England).
NOTES ON COMPRESSIBLE FLOW EQUATIONS FOR THERMODYNAMICS OF HOT JETS
C. L. Bore Aug. 1984 4 p refs
(BAe-KRS-N-GEN-273) Copyright. Avail: Issuing Activity

The ratio of specific heats appropriate for high temperature gas flows is discussed. It is suggested that mere substitution of different values of the gas properties for the highest temperatures may not be correct. Author (ESA)

N85-18290*# Informatics General Corp., Palo Alto, Calif.
AN IMPLICIT, CONSERVATIVE, ZONAL-BOUNDARY SCHEME FOR EULER EQUATION CALCULATIONS
Man Mohan Rai Feb. 1985 34 p refs
(Contract NAS2-11555)
(NASA-CR-3865; A-9823; NAS 1.26:3865) Avail: NTIS HC A03/MF A01 CSCL 20D

A zonal, or patched, grid approach is one in which the flow region of interest is divided into subregions which are then discretized independently, using existing grid generators. The equations of motion are integrated in each subregion in conjunction with zonal boundary schemes which allow proper information transfer across interfaces that separate subregions. The zonal

approach greatly simplifies the treatment of complex geometries and also the addition of grid points to selected regions of the flow. A conservative, zonal boundary condition that could be used with explicit schemes was extended so that it can be used with existing second order accurate implicit integration schemes such as the Beam-Warming and Osher schemes. In the test case considered, the implicit schemes increased the rate of convergence considerably (by a factor of about 30 over that of the explicit scheme). Results demonstrating the time accuracy of the zonal scheme and the feasibility of performing calculations on zones that move relative to each other are also presented. M.G.

N85-18291*# Massachusetts Inst. of Tech., Cambridge. Gas Turbine Lab.

RESEARCHED APPLIED TO TRANSONIC COMPRESSORS IN NUMERICAL FLUID MECHANICS OF INVISCID FLOW AND VISCOUS FLOW Final Report

W. T. Thompkins, Jr. Feb. 1985 83 p refs
(Grant NAG3-9)
(NASA-CR-174353; NAS 1.26:174353) Avail: NTIS HC A05/MF A01 CSCL 20D

A streamline Euler solver which combines high accuracy and good convergence rates with capabilities for inverse or direct mode solution modes and an analysis technique for finite difference models of hyperbolic partial difference equations were developed. B.G.

N85-18292*# Pennsylvania State Univ., State College. Applied Research Lab.

THE BOUNDARY LAYER ON COMPRESSOR CASCADE BLADES Semiannual Progress Report, 1 Jun. - 1 Dec. 1984

Steven Deutsch and William C. Zierke 1984 47 p refs
(Grant NsG-3264)
(NASA-CR-174369; NAS 1.26:174369) Avail: NTIS HC A03/MF A01 CSCL 20D

The flow field about an airfoil in a cascade at chord Reynolds number (R sub C) near 50,000. The program is experimental and combines laser Doppler anemometry (LDA) with flow visualization techniques in order to obtain detailed flow data (e.g., boundary layer profiles, points of separation and the transition zone) on a cascade of highly-loaded compressor blades. The information provided is to serve as benchmark data for the evaluation of current and future compressor cascade predictive models, in this way aiding in the compressor design process. The completed pressure surface mean velocity profiles, as well as two detailed near wake velocity profiles, all at a single incidence angle are provided. B.G.

N85-18293# Naval Research Lab., Washington, D. C.

A FREE SHEAR LAYER PREDICTION OF THE TURBULENT WAKE OF A FLAT PLATE TOWED BELOW A FREE SURFACE

R. A. Skop 18 Dec. 1984 17 p
(RR0-2301)
(AD-A148699; NRL-MR-5476) Avail: NTIS HC A02/MF A01 CSCL 20/4

The turbulence modeled, parabolic Navier-Stokes equations are used to predict the wake of a flat plate towed below a free surface. Prandtl's free shear layer approximation is employed to represent the turbulent kinematic viscosity. The agreement between the predicted and measured velocity profiles is found to be excellent. GRA

N85-18294# United Technologies Research Center, East Hartford, Conn.

CARS TEMPERATURE MEASUREMENTS IN SOOTING, LAMINAR DIFFUSION FLAMES Progress Report, 1 Jan. 1981 - 30 Jul. 1984

L. R. Boedeker and G. M. Dobbs 30 Jul. 1984 33 p
(Contract N00014-81-C-0046)
(AD-A148801; TR-1) Avail: NTIS HC A03/MF A01 CSCL 20/13

Temperature distributions have been measured in axisymmetric ethylene-air diffusion flames using high spatial resolution coherent anti-Stokes Raman spectroscopy. As ethylene flow increased and the flame approached a smoke-point condition, the temperatures attained in the upper part of the flame were reduced by about 300K below the maximum radial temperatures low in the flame. Addition of diluent N2 to ethylene caused a reduction in temperature low in the flame but increased temperature higher in the flame. Maximum temperatures attained in all ethylene flames were between 0.84 and 0.89 of respective adiabatic flame temperatures (AFT). The upper temperature of the near-smoke-point flame was only 0.76 of AFT. Results are compared with the generalized flame front model of Mitchell. MIE scattering measurements are also discussed. Brief studies with propane and a nonsooting, CO flame are reported; maximum axial and radial temperatures were between 0.84 and 0.87 of AFT. Results indicate the importance of thermal loss from soot radiation, radial transport processes and fuel pyrolysis. Nonluminous radiation and finite reaction rates are other possible factors. The upper luminous part of the highly sooting ethylene flame is likely above the primary flame front and is a soot burnout zone. GRA

N85-18295# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON THE CLASSIFICATION AND NONLINEAR SOLUTION OF ONE TYPE OF STRATIFIED SHEAR FLOW

L. Shida, C. Jiayi, L. Shishi, and W. Shufang 5 Nov. 1984 22 p Transl. into ENGLISH from Lixue Xuebao (China), v. 16, no. 2, Mar. 1984 p 121-131
(AD-A148832; FTD-ID(RS)T-1151-84) Avail: NTIS HC A02/MF A01 CSCL 20/4

One type of progressive wave motion is considered and a set of two-variable ordinary differential equations is derived for the selfgoverning dynamic system of this type of fluid motion. The geometric topological structure of the integration curve was analyzed qualitatively in the vicinity of the origin of a phase plane which used the perturbation velocity and density as coordinates. The effects of the shear d(bar u)/dz and Richardson number on the stability of the flow within the stratified shear flows were examined. The nonlinear internal gravity wave equation for stratified shear fluid was investigated. R.S.F.

N85-18296# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

CRITICAL FLASHING FLOW OF SUBCOOLED FLUIDS IN NOZZLES WITH CONTOUR DISCONTINUITIES

J. R. Fincke 1984 10 p refs Presented at the 22nd Natl. Heat Transfer Conf., Niagara Falls, N.Y., 5 Aug. 1984
(Contract DE-AC07-76ID-01570)
(DE84-017229; EGG-M-08284; CONF-840816-16) Avail: NTIS HC A02/MF A01

A series of experiments was performed to characterize choking in a convergent-divergent nozzle with subcooled upstream conditions. Testing was conducted in a low pressure flow loop (300 kPa). The variables measured were flow rate, upstream pressure and temperature, and axial-wall and centerline pressure profiles in the nozzle. The data indicate that the departure from thermodynamic equilibrium observed is dependent on radial heat transport in a central liquid jet surrounded by vapor. A description of the phenomena based on a six equation separated flow model was developed. The constitutive equations required to complete the model were derived from analysis of energy transport in the jet and contain derivatives of a dependent variable. DOE

N85-18297# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

HEAT-TRANSFER ENHANCEMENT IN NATURAL CONVECTION ENCLOSURE FLOW

Mark Bohn and Ren Anderson Aug. 1984 44 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013048; SERI/TR-252-2103) Avail: NTIS HC A03/MF A01

The enhancement of natural convection heat transfer in an enclosure was studied experimentally in a water filled test cell at Rayleigh numbers of theta (10 to the 10th power). Surface average

heat transfer, local heat transfer, and flow visualization were compared for a smooth and rough vertical heated wall. The facing cooled wall was smooth. The roughness was distributed over the entire heated wall and was of a height comparable to the velocity boundary layer thickness. Results indicate that the roughness promotes boundary layer transition giving fully turbulent behavior at overall Rayleigh numbers about half that for the smooth wall. Local increases in heat transfer of about 40% and surface averaged heat transfer increases of about 16% were observed. DOE

N85-18298# Sandia Labs., Albuquerque, N. Mex. Fluid and Thermal Science Dept.
NATURAL CONVECTION EXPERIMENTS ABOUT A FINITE-LENGTH CYLINDRICAL HEAT SOURCE IN A LIQUID-SATURATED POROUS MEDIUM
Daniel C. Reda 1984 29 p refs Presented at the AIChE Ann. Meeting, San Francisco, 25 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE84-012657; SAND-83-2209C; CONF-841121-2) Avail: NTIS HC A03/MF A01

Convective heat transfer in liquid-saturated porous media was investigated utilizing a geometry and hydrodynamic/thermal boundary condition, relevant to the problem of nuclear waste isolation in geologic repositories. The transient and steady state thermal fields were measured throughout an annular region bounded by vertical, coaxial cylinders. The inner cylinder was comprised of a finite length heat source, supported above and below by insulating sections; the outer cylinder was maintained at a constant temperature. An overlying liquid layer was used to impose a permeable upper surface boundary condition; this layer was maintained at a constant temperature equal to that of the outer cylinder. All properties of the porous medium, including porosity, permeability, and effective thermal conductivity were measured. It is shown that steady state heater surface temperatures (at constant heater power) increases with increasing vertical distance due to the buoyantly driven upflow. The measured steady state radial temperature drop across the annulus was found to systematically depart from the finite length cylinder conduction solution as heater power was increased. Comparisons between measured results and numerical predictions obtained using the finite element code MARIAH showed very good agreement. DOE

N85-18299# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mathematics.
THREE-DIMENSIONAL VORTEX METHODS Ph.D. Thesis
Claud A. Greengard Aug. 1984 61 p refs
(Contract DE-AC03-76SF-00098)
(DE85-000391; LBL-18217) Avail: NTIS HC A04/MF A01

Reformulations of the filament method and of the method of Beale and Majda show them to be very similar algorithms. The method of Anderson in which vorticity is evaluated by the exact differentiation of the approximate velocity field is discussed. It is shown that, in the inviscid version of this algorithm, each approximate vector of vorticity remains tangent to a material curve moving with the computed flow, with magnitude proportional to the stretching of this vortex line. It is explained that the expanding core vortex method converges to a system of equations different from the Navier-Stokes equations. Computations with the filament method of the inviscid interaction of two vortex rings are reported, both with single filaments in each ring and with a fully three-dimensional discretization of vorticity. The dependence on parameters is discussed, and convergence of the computed solutions is observed. DOE

N85-18300# Argonne National Lab., Ill.
ACCURACY OF THE FINITE ANALYTIC METHOD FOR SCALAR TRANSPORT CALCULATIONS
S. P. Vanka Sep. 1984 25 p refs
(Contract W-31-109-eng-38)
(DE85-001474; ANL-84-63) Avail: NTIS HC A02/MF A01

The accuracy of the finite analytic method of discretizing fluid flow equations is assessed through calculations of multidimensional scalar transport. The transport of a scalar function in a uniform velocity flow field inclined with the finite difference grid lines is calculated for a range of grid Peclet numbers and flow skewness. The finite analytic method is observed to be superior to the approach of constructing finite difference analogs from locally one dimensional resolution of the flow vector. However, the finite analytic method also produces appreciable errors locally in regions of steep variations, under conditions of large grid Peclet numbers, and skewness of the streamlines. DOE

N85-18301# California Univ., Berkeley. Lawrence Berkeley Lab.
INFLUENCE OF TURBULENCE ON EROSION BY A PARTICLE-LADEN FLUID JET
S. Dosanjh and J. A. C. Humphrey May 1984 61 p refs Presented at the AIChE Ann. Meeting, San Francisco, 25 Nov. 1984
(Contract DE-AC03-76SF-00098)
(DE84-014365; LBL-17247; CONF-841121-4) Avail: NTIS HC A04/MF A01

The effects of turbulent diffusion on particle dispersion, and hence erosion, are demonstrated numerically. Variations imposed on the level of turbulence intensity in a particle-laden jet impinging normally on a flat wall show a strong dependence of wear parameters on this quantity. Impacting particle velocities, trajectories and surface densities are predicted from Lagrangian equations of motion. Eulerian equations are used to describe fluid motion, with the turbulence viscosity evaluated from a k-epsilon model of turbulence. Nonessential complexities are avoided by assuming one way coupling between phases and using an adjusted Stokes' drag relation. Numerical calculations reveal that the relative rate of erosion decreases and the location of maximum wear is displaced toward the stagnation point as the turbulence intensity increases. DOE

N85-18302# Argonne National Lab., Ill.
THERMAL STRIPING DOWNSTREAM OF A HORIZONTAL ELBOW UNDER THERMALLY STRATIFIED TRANSIENT FLOW CONDITIONS
T. M. Kuzay and K. E. Kasza Jun. 1984 6 p refs Presented at the Joint Meeting of the American Nuclear Society and the Atomic Industrial Forum, Washington, D.C., 11 Nov. 1984
(Contract W-31-109-eng-38)
(DE84-014687; CONF-841105-10) Avail: NTIS HC A02/MF A01

A thermally stratified flow produced by a thermal transient passing through a horizontal elbow gives rise to large thermal fluctuations on the inner curvature wall of the downstream piping. These fluctuations were measured in a specially instrumented horizontal pipe and elbow system on a test set-up using water in the Mixing Components Technology Facility. The influence of thermal buoyancy on general reactor component performance is studied. The influence of pipe flow generated thermal oscillations on the structured thermal stresses induced in the pipe walls is discussed. DOE

N85-18303# Idaho National Engineering Lab., Idaho Falls.
ROTARY MAGNETIC HEAT PUMP
L. D. Kirol and J. I. Mills 1984 9 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AC07-76ID-01570)
(DE84-017017; EGG-M-24283; CONF-840804-47) Avail: NTIS HC A02/MF A01

Magnetic heat pumps use the magneto-caloric effect to produce entropy changes necessary for heat pumping. A rotary magnetic heat pump was analyzed and computer models were developed. The contribution of viscous heat to the regenerator heat balance was found to significantly restrict performance. The contribution of viscous heating is at least as important as the temperature differences required for regenerator heat transfer. Multiple magnet coils on a single rotor reduce the viscous work per field change cycle and result in greatly improved performance. Operation at 80% of Carnot efficiency with a beat pumping rate of 10 kW per kilogram of magnetic material is predicted. DOE

N85-18304# Rocket Research Corp., Redmond, Wash.
SULFURIC ACID CHEMICAL HEAT PUMP PROGRAM, MARCH - NOVEMBER 1982 Final Report
Mar. 1984 249 p refs
(Contract DE-AC02-76CH-00016)
(DE84-017436; BNL-51736) Avail: NTIS HC A11/MF A01

The verification test unit (VTU) designed, built and demonstrated during the previous contract, was tested extensively. System performance tests using both a single simulated waste heat source and two simulated heat sources of differing temperatures were completed. System thermal coefficients of performance ranged from 0.03 to 0.4, depending on test conditions. Steady temperature amplification was repeatedly achieved. An extended duration test with a total operation time in excess of 100 hours was completed. Near the end of the program, the chemical heat pump technology covering requirements, performance, and testing was transferred to the private sector at a one day seminar. DOE

N85-18305# Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany).
DEVELOPMENT OF MULTIGRID ALGORITHMS FOR PROBLEMS FROM FLUID DYNAMICS
Klaus Becker and Ulrich Trottenberg Sep. 1984 14 p refs Sponsored by Deutsche Forschungsgemeinschaft
(GMD-111) Avail: NTIS HC A02/MF A01

A Carterian multigrid algorithm for inviscid compressible two dimensional subsonic potential flow around a profile was developed. It features lexicographic column relaxation, standard full weighting of residuals, and bilinear interpolation of corrections. Circulation to fulfill the discrete Kutta-Joukowsky condition is changed only on the coarsest grid. Residual reduction factors per cycle of 0.05 to 0.1 are obtained. Results using the adaptive grid refinement technique are shown. The mesh size of the finest grid is hx = hy = 1/183. The iteration on this grid was terminated after the maximum residual was below the bound of 0.000005. Computing time is 15 to 19 sec on an IBM 3083 B Computer (BS-3000 FORTRAN 77, OPT=3). The total number of grid points used is 15,000. Author (ESA)

N85-18306# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
A SERIES EXPANSION STUDY OF THE NAVIER-STOKES EQUATIONS
Anthony Edward Perry (Melbourne Univ.) May 1984 92 p refs
(DFVLR-FB-84-34; ISSN-0171-1342) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 21.50

An algorithm to derive the relations between the coefficients of a series expansion solution of the incompressible Navier-Stokes and continuity equations is obtained. Steady and unsteady flow are considered. Relations necessary for closure are supplied by the boundary conditions. The algorithm is applied to cases whose solutions were obtained using other methods. The algorithm can be used for computational methods and for generating analytically complex flow patterns which are known to be asymptotic solutions of the Navier-Stokes and continuity equations. Author (ESA)

N85-18307# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
DEVELOPMENTS IN GAS METERING TECHNOLOGY
C. A. Spearman and P. Jepson Feb. 1983 12 p Submitted for publication
(ERS-E.348) Avail: NTIS HC A02/MF A01

Gas transmission metering, customer metering, and insertion meters are discussed. The construction of high pressure, large volume flow calibration facilities enables inferential type meters to be used for transmission metering. It is envisaged that turbine, vortex shedding and ultrasonic meters will supercede orifice plate systems. The application of meters without moving parts, such as the fluidic oscillator, is promising. The application of electronic and microprocessor power at metering installations improves the reliability of flow correction and computation and enables load information to be obtained and related to process efficiency. There is a requirement for an insertion metering device for measuring gas velocities in the range 0.15 to 3.0 m/sec. Author (ESA)

N85-17940# West Virginia Univ., Morgantown.
POTENTIAL APPLICATIONS OF FORCED UNSTEADY FLOWS
H. Viets, G. M. Palmer, and R. J. Bethke *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 21-27 (For primary document see N85-17937 09-01)
(Grant AF-AFOSR-0291-82)
(AD-P004155) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17944# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.
COMPARATIVE VISUALIZATION OF ACCELERATING FLOW AROUND VARIOUS BODIES, STARTING FROM REST
P. Freymuth, M. Palmer, and W. Bank *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 52-57 (For primary document see N85-17937 09-01)
(AD-P004159) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17946# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR UNSTEADY SEPARATED FLOWS
W. L. Hankey *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 73-75 (For primary document see N85-17937 09-01)
(AD-P004161) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17949*# Southern Methodist Univ., Dallas, Tex.
SOME STRUCTURAL FEATURES OF UNSTEADY SEPARATING TURBULENT SHEAR FLOWS
R. L. Simpson *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 90-96 (For primary document see N85-17937 09-01)
(Contract NsG-2354)
(AD-P004164) Avail: NTIS HC A09/MF A01 CSCL 20D

N85-17951# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
ON THE SHEDDING OF VORTICITY AT SEPARATION
D. P. Telionis and D. Mathioulakis *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 106-116 (For primary document see N85-17937 09-01)
(AD-P004166) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17957# Stanford Univ., Calif.
EXPERIMENTS ON CONTROLLED, UNSTEADY, SEPARATED TURBULENT BOUNDARY LAYERS
W. C. Reynolds, R. Jayaraman, and L. W. Carr *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 158-164 (For primary document see N85-17937 09-01)
(AD-P004172) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17958# University of Southern California, Los Angeles.
GENESIS OF UNSTEADY SEPARATION
C. M. Ho *In* AFOSR Proc. of the Workshop on Unsteady Separated Flow 1984 p 165-168 (For primary document see N85-17937 09-01)
(Contract F49620-82-K-0019)
(AD-P004173) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-17961# Stanford Univ., Calif. Dept. of Mechanical Engineering.
NATURAL UNSTEADINESS OF A SEPARATION BUBBLE BEHIND A BACKWARD-FACING STEP
J. K. Eaton and A. E. Alving *In* AFOSR Proc. of Workshop on Unsteady Separated Flow 1984 p 184-186 (For primary document see N85-17937 09-01)
(AD-P004176) Avail: NTIS HC A09/MF A01 CSCL 20/4

N85-18188# Yamaguchi Univ. (Japan). Dept. of Civil Engineering.

ON THE VIRTUAL WALL HEIGHT IN OPEN CHANNEL FLOW WITH LARGE RELATIVE ROUGHNESS
Takashi Saitou, Kesayoshi Hadano, Masafumi Kamachi, and Hajime Honmyo *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 249-256 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

N85-18201# Joint Publications Research Service, Arlington, Va.
DESIGNING THE PROFILE OF TURBINE BLADES USING AN ITERATION TECHNIQUE Abstract Only
G. A. Sokolovskiy and V. A. Vanin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 13 Transl. into ENGLISH from Probl. Mashinostr. (Kiev), no. 19, Nov. 1983 p 85-87 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18202# Joint Publications Research Service, Arlington, Va.
CALCULATING SECONDARY NONVISCOUS GAS FLOWS IN SPATIAL CASCADES OF TURBINES Abstract Only
V. I. Gnesin and V. G. Solodov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 14 Transl. into ENGLISH from Probl. Mashinostr. (Kiev), no. 19, Nov. 1983 p 91-95 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18203# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF TOTAL PRESSURE LOSSES IN STEPPED ANNULAR DIFFUSORS WITH CURVILINEAR OUTER WALLS AND UNIFORM VELOCITY FIELD AT INLET Abstract Only
A. Ya. Dantsyg and N. M. Petrov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 15 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 63-66 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18204# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF NORMALIZED FREQUENCY ON TIME-DEPENDENT AERODYNAMIC CHARACTERISTICS OF VANE BLADING PROFILES Abstract Only
V. I. Gnesin and S. V. Yershov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 15-16 Transl. into ENGLISH from Probl. Mashinostr. (Kiev), no. 19, Nov. 1983 p 88-91 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18205# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SECONDARY FLOW RATE ON DYNAMIC STRESSES IN TURBINE ROTOR BLADES Abstract Only
G. D. Shekun *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 16-17 Transl. into ENGLISH from Teploenerg. (Moscow), no. 2, Feb. 1984 p 65-66 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18212# Joint Publications Research Service, Arlington, Va.
CALCULATING HEAT TRANSFER COEFFICIENTS FOR TURBINE PROFILES TAKING SURFACE CURVATURE AND ELEVATED FLOW TURBULENCE INTO ACCOUNT Abstract Only
V. D. Sovershennyy and S. P. Chikova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 21-22 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 38-42 Original language document was announced in IAA as A84-25561 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18217# Joint Publications Research Service, Arlington, Va.
ON VORTEX TRANSPORT IN TURBINE CHANNELS Abstract Only
A. A. Bykov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 29 Transl. into ENGLISH from Probl. Machinostr. (Kiev), no. 19, Nov. 1983 p 95-97 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18218# Joint Publications Research Service, Arlington, Va.
TURBULENT JET FLOW IN A CHANNEL WITH A CIRCULATION REGION Abstract Only
G. A. Glebov and V. N. Petrov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 104-105 Original language document was announced in IAA as A84-25583 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18220# Joint Publications Research Service, Arlington, Va.
LONG RANGE EFFECT OF TURBULENT PRESSURE PULSATIONS IN PLANE-PARALLEL FLOWS AT DIFFERENT VELOCITIES WITH VARIOUS FLAME FRONTS Abstract Only
G. N. Abramovich and V. B. Rutovskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 31 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 3-10 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-18308 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
AUTOMATIC ANALYSIS OF SPECKLE PHOTOGRAPHS BY MICROCOMPUTER
P. J. Pobgee Sep. 1984 41 p ref
(NPL-DITC-47/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

The optics, electronics, software and operation of a speckle photograph analyzer are described. It achieves comparable accuracy to a skilled human operator, while removing the subjective element. The computer program fits in a single ROM chip, avoiding the requirement for magnetic tape of disk equipment. Measurement of a single spot on a speckle photograph is performed in < 2 sec and could be reduced by adjustment to the motor ramp waveform and/or power. The time to sample a matrix of points depends on the mechanical constraints of the X and Y traverses but should be < 5 min for a matrix of 10 by 10 points.
Author (ESA)

N85-18309*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
THE EVALUATION OF A DEFORMABLE DIFFRACTION GRATING FOR A STIGMATIC EUV SPECTROHELIOMETER Progress Report, 15 Feb. - 15 Aug. 1984
J. Gethyn Timothy Aug. 1984 11 p
(Grant NAGw-540)
(NASA-CR-174350; NAS 1.26:174350) Avail: NTIS HC A02/MF A01 CSCL 14B

Two crucial areas in the development of the high resolution EUV spectroheliometer are the elastically deformable toroidal diffraction grating and the open-structure imaging pulse counting detector system. The optical performance of a high frequency toroidal grating at EUV wavelengths was verified with a 3600 groove/mm master grating on a spherical concave blank. An open-structure (256 x 1024) pixel, multi-anode microchannel array was developed and tested as a pulse counting detector

system. These two systems verify the proof of concept of the spectroheliometer design. B.G.

N85-18310# Naval Surface Weapons Center, White Oak, Md. Radiation Div.

AN INEXPENSIVE VECTOR THIN FILM MAGNETOMETER Final for FY83

Paul E. Hunter, Leonard J. Schwee, Frank G. Salton, and Mary T. Shephard 1 May 1984 49 p

(AD-A148725; NSWC/TR-83-296) Avail: NTIS HC A03/MF A01 CSCL 17/6

This report details the work performed in the 1983 fiscal year on a project oriented at producing thin film magnetometers. These sensors will prove to be very economical in mass production because of integrated circuit fabrication techniques used. The device is well characterized and its operation understood. Included in this report are data on its vector nature, linear dynamic range, biased field effects, thermal response and small field response. Finally, an application in ordnance round identification is described. GRA

N85-18311# LTV Aerospace and Defense Co., Dallas, Tex. Vought Missiles and Advanced Programs Div.

MOBILE ACCELERATOR NEUTRON RADIOGRAPHY SYSTEM Final Report, Feb. 1978 - Dec. 1983

W. E. Dance, S. F. Carollo, and H. M. Bumgardner Watertown, Mass. Army Materials and Mechanics Research Center Oct. 1984 149 p

(Contract DAAG46-78-C-0007)

(AD-A148808; Rept-3-56000/4R-169; AMMRC-TR-84-39) Avail: NTIS HC A07/MF A01 CSCL 14/5

The use of neutron radiography for the inspection and maintenance of large structures such as aircraft has been delayed by the absence of a mobile system particularly suited to the requirements of field use. This report describes the production, extensive field testing, evaluation and disposition of the first mobile neutron radiography system to satisfy the majority of requirements for field use. The system is based upon the concept of a mobile on-off neutron radiography system based on a sealed-tube ion accelerator as neutron source demonstrated earlier by the Vought Corporation. Primary features of the system are its self-propelled mobility, versatile positioning capability scaled to Army helicopter dimensions, an on-off beam capability, exposure capability measured in minutes, and suitability for AMMRC laboratory and field use. Included in the report are a description of all components of the system, an evaluation of the operation of the system, an evaluation of its radiographic capabilities, a description of installation elements for the AMMRC site, and recommendations for next-generation systems. Author (GRA)

N85-18312# Sandia Labs., Albuquerque, N. Mex.

PRESSURE MEASUREMENTS IN A HYDROGEN COMBUSTION ENVIRONMENT: AN EVALUATION OF 3 PRESSURE TRANSDUCERS

B. W. Marshall, Jr. and A. C. Ratzel, III May 1984 68 p refs Sponsored by DOE 2 Vol.

(TI85-003645; NUREG/CR-3721-Vol-2; SAND-83-2621) Avail: NTIS HC A04/MF A01

A series of hydrogen air combustion tests were performed to evaluate the performance of three strain gage type pressure tranducers in a combustion environment. The three types of gages were Precise sensor models 111-1 and 141-1 and Kulite model XT-190. Stainless steel felt metal was used to provide thermal protection for the transducer diaphragms. The effect of such shielding on the dynamic pressure response of a transducer during a combustion experiment was investigated. Results indicate that the three pressure transducers, when thermally shielded with felt metal, recorded peak combustion pressures that were generally within 5% of the statistical mean for each test. The pressure profiles and associated burn times obtained from all of the protected transducers were also comparable. The Precise sensor model III-I gages, when unprotected, were affected significantly by the hot gases of combustion and must be thermally protected with felt metal to obtain accurate measurements. R.S.F.

N85-18313# Vitro Labs., Silver Spring, Md.

SURVEY OF REMOTE DATA MONITORING SYSTEMS

T. L. Logee, P. W. Kendall, E. O. Pollock, M. G. Raymond, and R. C. Knapp, Jr. Sep. 1984 63 p refs

(Contract DE-AC01-79CS-30027)

(DE85-001385; SOLAR/0013-84/30) Avail: NTIS HC A04/MF A01

A self-contained data-logger device called an SDAS (Site Data Acquisition Subsystem) was built for the National Solar Data Network (NSDN) which could collect analog data from 96 channels, store the data for up to three days, and then transmit the stored data on request to a central facility by voice-grade telephone lines. This system has worked fairly well for the eight years that it has been in service. However, the design and components are getting old and newer dataloggers may be more reliable and accurate and less expensive. The results of an extensive search for an SDAS replacement were discussed. The survey covered 62 models from 36 manufactureres. These numbers are not indicative of all the dataloggers or manufacturers available, but only those which appeared to have some qualifications for the NSDN datalogger replacement. This report views the datalogger as a system which is made up of sensors, a data acquisition and storage unit, a telecommunications subsystem, and a data processing subsystem. DOE

N85-18314# California Univ., Livermore. Lawrence Livermore Lab.

HIGH-SPEED, EIGHT-FRAME ELECTRO-OPTIC CAMERA WITH MULTIPULSED RUBY LASER ILLUMINATOR

Larry Shaw, L., Lloyd L. Steinmetz, William C. Behrendt, John B. Sonderman, Glenn K. Beer, Lynn G. Seppala, Emilio Romero, and Kenneth Mikkelson (Sandia National Lab., Albuquerque) Sep. 1984 8 p refs Presented at the 16th Intern. Cong. on High Speed Photography and Photonics, Strasbourg, 27 Aug. 1984

(Contract W-7405-ENG-48)

(DE85-001748; UCRL-90478; CONF-840887-11) Avail: NTIS HC A02/MF A01

A high speed, electro-optic camera that features a large format; eight frames; and an accompanying eight pulse, ruby laser illuminator was developed. The eight 75-mm frames provide high dynamic spatial resolution and time resolution to record fine physical details of rapid events. Four independent two frame (tube) cameras complete with objective optics comprise the eight frame array. Pulsed ruby laser illumination with spectral filtering allows photography in intense ambient light. DOE

N85-18315# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

P-I-N CdTe GAMMA-RAY DETECTORS BY LIQUID PHASE EPITAXY (LPE)

S. H. Shin, G. T. Niizawa, J. G. Pasko, G. L. Bostrup, F. J. Ryan, M. Khoshnevisan, C. I. Westmark, and C. Fuller 1984 5 p Presented at the Nucl. Sci. Symp., Orlando, Fla., 1 Nov. 1984 Prepared in cooperation with Sandia National Labs., Albuquerque, New Mex.

(Contract DE-AC04-76DP-00789)

(DE84-012276; SAND-84-1036C; CONF-841156-1) Avail: NTIS HC A02/MF A01

A new device concept of CdTe gamma ray detectors was demonstrated by using p+(HgCdTe)-n(CdTe)-n+(HgCdTe) diode structures. Both p+ and n(+)-type Hg/sub 0.25/Cd/sub 0.75/Te epilayers were grown by the liquid phase epitaxy (LPE) technique on semi-insulating CdTe sensor elements. The LPE grown P-I-N structure offers potential advantages for p-n junction formation and ohmic contact over standard ion implanted diodes or Schottky barrier devices. Detectors with active areas of 2 mm(2) were fabricated. Resolutions of 10 keV were obtained for the 122 keV gamma peak of Co(57) at room temperature. DOE

N85-18316# Oak Ridge National Lab., Tenn. Chemistry Technology Div.
DEVELOPING A FLOWMETER FOR STREAMS WITH HIGH SOLIDS CONTENT
J. K. Johnson and J. H. Wilson Jul. 1984 55 p refs
(Contract DE-AC05-84OR-21400)
(DE84-016643; ORNL/TM-8675) Avail: NTIS HC A04/MF A01

A type of flowmeter, based on a piping arrangement similar to a Wheatstone bridge, was tested to measure the flow rate of the feed to the Kerr-McGee critical solvent deashing (CSD) unit of the solvent refined coal pilot plant in Wilsonville, Alabama. To simulate the non-Newtonian behavior of the CSD feed stream, mineral oil and a mixture of a polymer, carboxymethyl cellulose, and water were used in the tests. It is shown that there is a direct relationship between the flow rate and the ratio of the pressure drops across the parallel legs of the flowmeter and across a line connecting the center of the parallel legs. A mathematical model, developed previously to predict the dynamics of the flow measuring system, was tested, and the predicted results matched the measured values fairly well. DOE

N85-18317# Lanchester Polytechnic, Coventry (England). Dept. of Mechanical Engineering.
CALIBRATION OF THERMOCOUPLES BASED ON TWO STATE POINTS OF WATER AND BS 4937; PART 5, 1974
T. T. Mohamad and C. C. Wright Jul. 1984 28 p refs
(Grant SERC-GR/8/8587.6)
Avail: NTIS HC A03/MF A01

A method for calibrating thermocouples is given. A FORTRAN 77 subroutine which converts thermocouple voltage into corresponding temperature and estimates uncertainty range is presented. Author (ESA)

N85-18318# FOM-Inst. voor Plasmafysica, Rijnhuizen, Jutphaas (Netherlands).
A COMPACT TIME-OF-FLIGHT ENERGY ANALYZER OF HIGH RESOLUTION Thesis - Utrecht Univ.
G. H. J. Notermans and H. W. vanderVen Apr. 1984 45 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-84-154) Avail: NTIS HC A03/MF A01

The design and calibration of a time-of-flight proton energy analyzer in the energy range 10 to 100 keV is described. Secondary electrons from a very thin carbon foil are used to detect a passing particle. The use of microchannel plates and the short flight-path (15 to 30 cm) permit a compact design with energy resolution of 2%. The analyzer may be used in an environment with a high background of neutrons and gamma radiation. The sensitivity of this background is strongly reduced by the doubly coincident detection of the particles. The small overall dimensions of the analyzer are important whenever the background level is so high that a screening cannot be completely avoided. Author (ESA)

N85-18319# FOM-Inst. voor Plasmafysica, Rijnhuizen, Jutphaas (Netherlands).
AN OPERATIONAL TEST OF A TIME-OF-FLIGHT ANALYZER AT THE ASDEX TOKAMAK Thesis - Utrecht Univ.
G. H. J. Notermans May 1984 33 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelink Onderzoek (ZWO)
(Rept-84-155) Avail: NTIS HC A03/MF A01

A time-of-flight energy analyzer for the investigation of the slowing-down spectrum of the heating beams at the ASDEX Tokamak, is described. The analyzer has a short flight path (15 cm), and energy resolution of a few percent. The analyzer was equipped with a preselecting, achromatic magnet system to separate the fast neutrals from thermal plasma particles and light. The analyzer detects protons in the energy range 10 to 40 keV. The energy calibration tested at the Tokamak by neutral heating beams agrees with earlier measurements. The analyzer performed very reliably and needed no maintenance during 4 months operation. The analyzer also functions reliably with coincident start direction, although the efficiency decreases by one order of magnitude. Author (ESA)

N85-18320# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
DEVELOPMENT OF THE GASCOPACT (R) PIPE AND CABLE TRACER
T. Mike Sporton Feb. 1983 28 p Presented at Gas Res. Inst. Res. Workshop on Safety Instrumentation in Distribution, Fla., 1-3 Feb. 1983
(ERS-E.340) Avail: NTIS HC A03/MF A01

A robust, hand-held instrument for locating underground pipes and cables before excavations by public utility workers was developed. It has direct indiction, no controls to adjust, good resolution, a weatherproof case, a hum detector for power lines, automatic built-in self calibration, back-up diagnostic equipment, and is insensitive to carrying angle. Performance is maintained in the temperature range minus 10 to + 40 C. Batteries are sufficient for 10 hr continuous use. It functions normally after immersion in 0.3 m water for 5 min. Mean time between failures is > 1 yr. Author (ESA)

N85-18321# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
BUCKLING AND ECCENTRICITY EFFECTS ON ORIFICE METERING ACCURACY
Roger Norman, Mehender Singh Rawat, and Peter Jepson Jun. 1983 18 p refs Presented at 1983 Intern. Gas Res. Conf., London, 13-16 Jun. 1983
(ERS-E.350) Avail: NTIS HC A02/MF A01

Flowmetering errors arising from elastic deflection of a plate are quantified and equations to choose correct thicknesses of plates to minimize these errors and avoid plastic buckling are derived. Differences between expressions for metering error are explained. The limit on plate flatness in ISO 5167 and AGA 3 is shown to be inadequate and to lead to systematic measurement errors of up to 0.2%. An experimental investigation into the effect of plate eccentricity on the accuracy of measurement is reported. Limits in ISO 5167 are extremely difficult to meet except in specialist laboratories. Air flow tests on 5 plates ranging from 0.75 to 0.2 beta ratio in a 150 mm line show that these concentricity limits can be substantially relaxed if an increase in uncertainty of 0.1% can be tolerated. Author (ESA)

N85-18322# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
SIMULATION IN THE DESIGN OF GAS PRESSURE CONTROL EQUIPMENT
Derek Stoves, Barry Thompson, and Philip Graham Jun. 1984 19 p refs Presented at Intern. Gas Res. Conf., London, Jun. 1983
(ERS-E.352) Avail: NTIS HC A02/MF A01

To investigate the effects of changes in significant parameters of gas supply network pressure regulating equipment, a regulator model was established. The modeling of a supply network posed particular problems due to the large variation in actual pipework arrangements. Acoustic analysis was used to identify a representative characterization of a network. Use of computer simulation to establish appropriate response criteria and aid the design of a regulator to satisfy these criteria is described. Author (ESA)

N85-18323# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
LOW POWER MICROPROCESSOR BASED MEASUREMENTS SYSTEM FOR DETERMINING THE INTEGRITY OF COATINGS ON BURIED PIPELINES
R. Toomer Aug. 1984 5 p Presented at IEE Colloq. on Low Power Microprocessor Appl., London, 11 Nov. 1983
(ERS-E.380) Avail: NTIS HC A02/MF A01

A hand held, low power consumption instrument (GASCOPLEX) for finding faults in coatings on underground pipelines was developed. It comprises a signal generator which supplies a crystal controlled, low frequency alternating current to the pipeline, and

the receiver which is carried along the pipeline route. The receiver measures magnetic field strength due to the signal current in the pipe. The magnetic field values allow the magnitude of local pipe current, current gradient and pipe depth to be obtained. The values of current gradient are automatically compared with a preset threshold and values greater than this threshold initiate an audible warning to the operator, signifying a coating defect. An integral guidance system is incorporated in the receiver to keep the operator within an acceptable band over the pipeline. Author (ESA)

N85-18324# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
GASCOPACT: A NEW APPROACH TO PIPE AND CABLE LOCATION
A. S. Blears (Data Acquisition Ltd.) and D. J. Daniels Nov. 1983 24 p Presented at 49th Inst. of Gas Engr. Autumn Meeting, London, 1983
(ERS-E.383; Communication-1217) Avail: NTIS HC A02/MF A01

A robust, hand-held instrument for locating underground pipes and cables before excavations by public utility workers was developed. It has direct indiction, no controls to adjust, good resolution, a weatherproof case, a hum detector for power lines, automatic built-in self calibration, back-up diagnostic equipment, and is insensitive to carrying angle. Performance is maintained in the temperature range minus 10 to + 40 C. Batteries are sufficient for 10 hr continuous use. It functions normally after immersion in 0.3 m water for 5 min. Mean time between failures is > 1 yr. Author (ESA)

N85-18325# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
AN EXPERIMENTAL INVESTIGATION INTO THE EFFECTS OF PLATE ECCENTRICITY AND ELASTIC DEFORMATION ON ORIFICE METER ACCURACY
R. Norman, M. S. Rawat, and P. Jepson Feb. 1984 19 p refs Presented at Intern. Conf. on Metering of Nat. Gas and Liquefied Hydrocarbon Gases, London, 1-2 Feb, 1984
(ERS-E.391) Avail: NTIS HC A02/MF A01

The effect of orifice plate eccentricity on gas metering accuracy was examined since the international standard requires concentricities which are extremely difficult to meet. The results show that a substantial relaxation of the requirements can be made without significant increase in measurement uncertainty. The effect of elastic deflection of an orifice plate under differential pressure was measured and shown to cause an underregistration of flow, the magnitude of which agrees with theory. The study confirms that the theory can be used to minimize the metering errors due to lack of initial flatness and elastic deformation of the plate. Author (ESA)

N85-18326# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
THE INFLUENCE OF MODERN CONTROL TECHNIQUES ON THE GAS INDUSTRY
A. S. Clark Dec. 1983 12 p refs Presented at North of Engl. Gas Assoc. Short Paper Meeting, 7 Dec. 1983
(ERS-E.395) Avail: NTIS HC A02/MF A01

The application of relatively low cost electronic control systems to improve gas supply system safety and integrity, increase the security of supply, minimize operating and maintenance costs, and maximize capacity and storage utilization is discussed. Applications to stream selection, remote boundary pressure control, volumetric control, and pressure control are considered. Author (ESA)

N85-18327# Southwest Research Inst., San Antonio, Tex.
ELECTRICAL RESISTIVITY TECHNIQUE TO ASSESS THE INTEGRITY OF GEOMEMBRANE LINERS Final Report, Sep. 1980 - Jul. 1984
David W. Shultz, Bob M. Duff, and Wendell R. Peters Nov. 1984 77 p refs
(Contract EPA-68-03-3033)
(PB85-122414/GAR; EPA-600/2-84-180) Avail: NTIS HC A05/MF A01 CSCL 14B

Two-dimensional electrical modeling of a liner system was performed using computer techiques. The modeling effort examined the voltage distributions in cross sections of lined facilities with different leak locations. Results confirmed that leaks in the liner influenced voltage distributions on the surface of the lined facility. Based on this, a small physical scale model of a lined facility was constructed. Tests were conducted to measure the influence of leaks on the surface voltage distributions of water-filled and earth-filled liner systems. Several leak and current electrode configurations were examined. Plots of measured surface voltages indicated the presence and location of a leak. These tests verified that the electrical resistivity technique could be used for detecting and locating leaks in liners. Larger-scale testing was performed a a 1-acre lined water impoundment. Author (GRA)

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-18328*# Maryland Univ., College Park.
CHARACTERIZATION OF CNRS FIZEAU WEDGE LASER TUNER
1984 12 p
(Grant NsG-5313)
(NASA-CR-174357; NAS 1.26:174357) Avail: NTIS HC A02/MF A01 CSCL 20E

A fringe detection and measurement system was constructed for use with the CNRS Fizeau wedge laser tuner, consisting of three circuit boards. The first board is a standard Reticon RC-100 B motherboard which is used to provide the timing, video processing, and housekeeping functions required by the Reticon RL-512 G photodiode array used in the system. The sampled and held video signal from the motherboard is processed by a second, custom fabricated circuit board which contains a high speed fringe detection and locating circuit. This board includes a dc level discriminator type fringe detector, a counter circuit to determine fringe center, a pulsed laser triggering circuit, and a control circuit to operate the shutter for the He-Ne reference laser beam. The fringe center information is supplied to the third board, a commercial single board computer, which governs the data collection process and interprets the results. R.G.

N85-18329# Naval Research Lab., Washington, D. C.
SIMULATION OF REPETITIVELY-PULSED LASER IRRADIATION OF GRAPHITE-EPOXY COMPOSITE
G. P. Mueller 12 Dec. 1984 31 p
(AD-A148698; NRL-MR-5467) Avail: NTIS HC A03/MF A01 CSCL 20/5

The CW laser irradiation code of Griffis, Masumura and Chang was modified to simulate pulsed laser irradiations. Extensive changes were required to cure the numerical instabilities produced in the code by the high peak powers common to pulsed lasers. The new code was tested against the original Griffis, Masumura and Chang code and against a simple heat capacity model. A comparison was made with some of the experimental pulsed irradiations of Cozzens, et al, resulting in doubts about the accuracy of the model for the thermal properties of the graphite-epoxy under rapid heating. GRA

N85-18330# Stanford Univ., Calif. Dept. of Applied Physics.
IMPROVED SOLID-STATE LASER SOURCES, VOLUME 2 Final Technical Report, 2 Sep. 1982 - 10 Feb. 1984
R. L. Byer Mar. 1984 69 p refs
(Contract W-7405-eng-48)
(DE85-000759; SU-YCRL-15561-Vol-2) Avail: NTIS HC A04/MF A01

The slab geometry laser concept was extended to increasingly larger slab glass systems and crystalline laser materials. Conduction cooling through a thin static gas layer was demonstrated for glass and crystalline materials. Continuous wave (CW) laser oscillation

was obtained in Nd:GGG demonstrating that the slab technique allows high average power operation in materials with large dn/dT. The first demonstration of optical parametric oscillation in a chalcopyrite crystal using AgGaS2 was made. The design and construction of a single crystal fiber growth machine was completed. Fibers of sapphire, ruby, lithium niobate, and Nd:YAG were grown. DOE

N85-18331# Physics International Co., San Leandro, Calif.
IMPLODING PLASMA X-RAY LASER RESEARCH Final Report
S. Wong, L. Koppel, L. Burr, R. Rodenburg, R. Fortner (California Univ., Livermore, Lawrence Livermore Lab.), R. Stewart (California Univ., Livermore, Lawrence Livermore Lab.), D. Dietrich (California Univ., Livermore, Lawrence Livermore Lab.), P. Egan (California Univ., Livermore, Lawrence Livermore Lab.), B. Young (California Univ., Livermore, Lawrence Livermore Lab.), and R. Dukart (Sandia National Lab., Albuquerque, N. Mex.) Sep. 1984 40 p refs
(Contract DE-AC03-81ER-10990)
(DE85-000057; DOE/ER-10990/T2) Avail: NTIS HC A03/MF A01

The population inversion mechanisms and gain estimates for the Ne-like Kr X-ray laser scheme are discussed. An experimental configuration was developed which produces stable plasmas with conditions close to the optimum for lasing. By imploding a coaxial argon plasma on an inner krypton plasma (the puff on puff configuration), a quiescent krypton center plasma was produced with an electron temperature of about 600 eV and an electron density of about 10 to the 21st power/cu cm. The center plasma was stable and linear, with little evidence of kink instabilities. Nozzle development work was also performed. The X-ray measurements of electron temperature and density as well as XUV linewidths are presented. DOE

N85-18332# Colorado Univ., Boulder. Dept. of Chemistry.
TIME-RESOLVED STUDIES OF FREE RADICALS AND LASER-INITIATED CHAIN REACTIONS Progress Report, Sep. 1981 - Sep. 1984
Stephen R. Leone 15 Sep. 1984 29 p refs
(Contract DE-AC02-79ER-10396)
(DE85-002100; DOE/ER-10396/4) Avail: NTIS HC A03/MF A01

The reactions, energy transfer, and dynamics of free radicals produced by ultraviolet laser photolysis were studied. The measurements on free radical chain reactions, absolute rate coefficients, and photofragmentation dynamics were carried out by time-resolved infrared emission spectroscopy. The dynamics of hot methyl radical reactions reveal that translational excitation is essential in the rate enhancement of several of these reactions. The partitioning of reaction exoergicity into vibrational excitation of the polyatomic products of methyl radical reactions is also studied. Some first rate coefficients are obtained for deactivation of the anti-symmetric stretch mode of vibrationally excited methyl radicals with a variety of partners. It is shown that the vibrational and translational temperatures in a laser initiated chain reaction differ substantially over the course of the chain. The photofragment emission spectrum of vibrationally and rotationally excited CO and CH3 produced in the photolysis of acetone is obtained. It is shown that laser multiphoton ionization of N2 is an alternative means of probing vibrational and rotational temperatures in combusting mixtures. DOE

N85-18333# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF NEUTRON IRRADIATION ON THE HIGH TEMPERATURE OPERATION OF INJECTION LASER DIODES
Charles E. Barnes 1984 7 p refs Presented at the SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE85-000068; SAND-84-0599C; CONF-840872-29) Avail: NTIS HC A02/MF A01

Certain optoelectronic applications for which it would be desirable to use an injection laser diode (ILD) require that the light source be exposed to a combined hostile environment of both radiation and high temperature. Because of the complexity of ILD's, it is very possible that these two hostile components will have detrimental synergistic effects on the laser. The effects of fast neutron irradiation on the high temperature (T less than or equal to 100 C) operation of ILD's was studied. In general, it was found that the ILD's were more sensitive to irradiation at higher temperatures, and that the lasers with the least temperature variation in threshold current were the least sensitive to irradiation. DOE

N85-18334# Oak Ridge National Lab., Tenn.
FEASIBILITY OF ALPHA PARTICLE MEASUREMENT BY CO2 LASER THOMSON SCATTERING
D. P. Hutchinson, K. L. VanderSluis, J. Sheffield, and D. J. Sigmar 1984 22 p refs Presented at 5th APS Topical Conf. on High Temperature Plasma Diagnostics, Tahoe City, Calif., 16 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001764; CONF-840922-4) Avail: NTIS HC A02/MF A01

The feasibility of CO2 laser Thomson scattering from a multicomponent burning plasma was evaluated for the measurement of the velocity distribution of D-T produced alpha particles. The density and velocity distribution of the alpha particles from their initial energy of 3.5 MeV down to near thermal energies may be measured by small angle (less than 10 deg) Thomson scattering. A computer simulation of the experiment indicates that a 100 MW pulsed laser combined with a bank of heterodyne receivers will be able to measure a scattered signal from the alpha particles with a post detection signal to noise ratio of 75 for an assumed alpha density of 7.5 x 10 deg to the 11th power/cu cm. DOE

N85-18335# California Univ., Livermore. Lawrence Livermore Lab.
S-11 AND S-20 PHOTOCATHODE RESEARCH ACTIVITY, REVISION 1
F. Gex, T. Huen, and R. Kalibjian 27 Aug. 1984 8 p refs
(Contract W-7405-eng-48)
(DE84-017164; UCID-19946-Rev-1) Avail: NTIS HC A02/MF A01

The S-1 semitransparent photocathode is the only one that can be used to study the 1.06 micron neodynium laser pulses of less than 10 ps duration. The results obtained are reviewed, and the role of the main constituents and their contributions in photoemission are determined. DOE

N85-18336# Tennessee Univ., Knoxville.
LASER ABLATION STUDIES USING RIS
D. W. Beekman and T. A. Callcott (ORNL) 1984 9 p refs Presented at the 2nd Symp. on Resonance Ionization Spectroscopy and its Applications, Knoxville, Tenn., 16 Apr. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001118; CONF-840449-14) Avail: NTIS HC A02/MF A01

A resonance ionization mass spectroscopy system which includes a Nd:YAG laser microprobe, multiphoton resonance ionization, a time-of-flight mass spectrometer, and a novel data acquisition system is described. The system was used to measure the relative population of thermally populated energy levels and the velocity distribution of samarium atoms vaporized by the laser microprobe to determine the excitation and kinetic temperatures. DOE

N85-18337# European Space Agency, Paris (France).
MICROWAVE DISCHARGE IN A SUPERSONIC FLOW FOR THE EXCITATION OF A GAS DYNAMIC CO LASER
Peter Hoffmann Jul. 1984 128 p refs Transl. into ENGLISH of "Mikrowellenentladung in einer Ueberschallstroemung zur Anregung eines gasdyn. CO-lasers" Rept. DFVLR-FB-83-21 DFVLR, Stuttgart, Jun. 1983 Original language document announced as N84-16558
(ESA-TT-833; DFVLR-FB-83-21) Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 41

Plasma physics of RF-discharges, gasdynamics of supersonic flows, and CO laser kinetics are discussed in order to describe a microwave excited gasdynamic CO laser. A method of coupling microwave energy to a discharge located within a supersonic flow

was elaborated. The coupling is effectuated within a flow channel, the walls of which serve as waveguide too, whereby the gas flow direction is identical to the microwave propagation. Experimental results agree with the theoretical model. Author (ESA)

N85-18338# Fondazione Ugo Bordoni, Rome (Italy).
QUANTUM NOISE EFFECTS IN SINGLE-MODE INJECTION LASERS
Salvatore Piazzolla and Paolo Spano Sep. 1984 14 p refs Sponsored by Istituto Superiore P.T.
(FUB-11-1984) Avail: NTIS HC A02/MF A01

The noise properties of single mode semiconductor lasers used in optical coherent communication systems were analyzed. The results explain the excessive linewidth and the presence of satellite peaks in the emission line of single-mode injection lasers. Author (ESA)

N85-17976# Rediffusion Simulation, Inc., Arlington, Tex.
THE USE OF LASERS IN WIDE-ANGLE VISUAL SYSTEMS
B. Barber *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 223-237 (For primary document see N85-17962 09-01)
(AD-P004322) Avail: NTIS HC A22/MF A01 CSCL 01/2

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-18339 Georgia Inst. of Tech., Atlanta.
TEMPERATURE PREDICTION IN MECHANICAL COMPONENTS, AN ANALYTICAL APPROACH Ph.D. Thesis
Burak Grecim 1984 265 p
Avail: Univ. Microfilms Order No. DA8424621

Possible forms of heat generation in a friction contact were analyzed. Transient temperatures in the vicinity of an asperity contact were derived. it is predicted that rapid and very localized temperature variations take place in the immediate vicinity of the asperity contact. Transient temperatures in cylindrical and spherical components were predicted by solving the heat conduction equation. An integral transform technique is utilized to solve the governing differential equation. The problems of a short cylinder (or a disk), layered cylinder, hollow cylinder and multiple heat sources on the surface of a cylinder are considered. The thermal network approach is outlined, including several case studied. This approach is used to predict the system bulk temperatures, where the components are represented by nodal points, and are connected by thermal resistances. Dissert. Abstr.

N85-18340 Georgia Inst. of Tech., Atlanta.
THE OPTIMAL CONTROL AND DESIGN OF A FLEXIBLE MANIPULATOR ARM Ph.D. Thesis
Viboon Sangveraphunsiri 1984 272 p
Avail: Univ. Microfilms Order No. DA8424629

It is assumed that the pervasiveness of manipulator arms on industrial robots is highly dependent on total system cost. Weight reduction appears to be one of the principal ways in which total cost can be reduced. A lightweight structure is flexible. Two research areas covered in this thesis are: (1) the control algorithms; and (2) the optimum selection of the motors and the gear ratios. Optimal control of a flexible manipulator arm includes the study of state estimataors (Luenberger observer and Kalman filter). The applicability of the implementation of these control routines in a digital computer are discussed also. The flexible system consists of a single flexible link with payload mass at the free-end and pure inertia mass at the pin-end. Lagrange's equation and the assumed-mode of vibration method are used for obtaining the dynamic model of the single flexible link. Minimum-Time position control and Quadratic-Optimal control are considered. In present technology, it is easy to implement the control digitally. Dissert. Abstr.

N85-18341# Sandia Labs., Albuquerque, N. Mex.
TWO-DIMENSIONAL MODELING OF CONDUCTION-MODE LASER WELDING
A. J. Russo, D. A. Benson, G. R. Hadley, and H. C. Peebles 1984 20 p refs Presented at the Intern. Conf. on Appl. Lasers and Electrooptics, Boston, 12 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-001804; SAND-84-1300C; CONF-8411100-1) Avail: NTIS HC A02/MF A01

The development of a predictive code for conduction-mode laser welding requires that models for the temperature-dependent absorption coefficient and vaporization interactions should be included with the thermal conduction calculation. An attempt to understand and quantify these surface phenomena by comparison of a two-dimensional code with experimental results is described. DOE

N85-18342# Oak Ridge National Lab., Tenn.
ADVANCEMENT OF REMOTE TECHNOLOGY: PAST PERSPECTIVES AND FUTURE PLANS
M. J. Feldman and W. R. Hamel 1984 17 p refs Presented at the Robotics and Remote Handling in the Nucl. Ind. Conf., Toronto, 23 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000934; CONF-840916-4) Avail: NTIS HC A02/MF A01

In the Consolidated Fuel Reprocessing Program a comprehensive remote systems development program has existed for the past 5 years. The new remote technology under development is expected to significantly improve remote operations by extending the range of admissible remote tasks and increasing remote work efficiency. The motivation and justification for the program are discussed by surveying the 40 years of remote operating experience which exists and considering the essential features of various old and new philosophies which were, or are used in remote engineering. A future direction based upon the Remotex concept is explained, and recent progress in the development of an advanced servomanipulator based maintenance concept is summarized to show that a new generation of remote systems capability is feasible through advanced technology. DOE

N85-18343# Oak Ridge National Lab., Tenn. Instrumentation and Controls Div.
CONTROL AND ELECTRONIC SUBSYSTEMS FOR THE ADVANCED SERVOMANIPULATOR
H. L. Martin, W. R. Hamel, S. M. Killough, and R. F. Spille 1984 9 p refs Presented at the Natl. Meeting on Robotics and Remote Handling in Hostile Environments, Tokyo, 24 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001900; CONF-840793-3) Avail: NTIS HC A02/MF A01

The advanced servomanipulator (ASM) is developed to perform remote maintenance in a nuclear fuel reprocessing plant where human access is not allowed. The primary function of the manipulator control system is to maintain stable, accurate master/slave operation while providing sensitive force reflection to the operator. The architectural structure of the control system is outlined and is compared to the previously developed Model M-2 control system, and justification for the advances incorporated into the ASM structure are given. The various modes of operation and diagnostics are described, and throughput requirements associated with joint servocontrol and counter balancing are discussed. The fundamental elements of the control system are reviewed, including the processor selection (Motorola MC68000) and the language (FORTH). The design decisions and the resulting design selections to serve as a base for future improvements are reviewed. Four main areas are covered: (1) system overview; (2) hardware implementation; (3) software partitioning; and (4) remote electronics considerations. Each area will address the specifics of the selected equipment or the functional requirements of the control method. DOE

N85-18344# Oak Ridge National Lab., Tenn. Engineering Div.
DUAL ARM MASTER CONTROLLER CONCEPT
D. P. Kuban and G. S. Perkins (JPL) 1984 6 p refs Presented

at the DOE/ORNL/PNC Natl. Top. Meeting on Robotics and Remote Handling in Hostile Environments, Tokyo, 24 Jul. 1984
(Contracts DE-AC05-84OR-21400; W-7405-eng-26)
(DE85-001901; CONF-840793-2) Avail: NTIS HC A02/MF A01

The advanced servomanipulator (ASM) slave was designed with an anthropomorphic stance, gear/torque tube power drives, and modular construction. These features resulted in increased inertia, friction, and backlash relative to tape-driven manipulators. Studies were performed which addressed the human factors design and performance trade-offs associated with the corresponding master controller best suited for the ASM. The results of these studies, as well as the conceptual design of the dual arm master controller, are presented. DOE

N85-18345# Oak Ridge National Lab., Tenn. Engineering Div.
ADVANCED REMOTELY MAINTAINABLE FORCE-REFLECTING SERVOMANIPULATOR CONCEPT
D. P. Kuban and H. I. Martin 1984 11 p refs Presented at the DOE/ORNL/PNC Natl. Top. Meeting on Robotics and Remote Handling in Hostile Environments, Tokyo, 24 Jul. 1984
(Contracts DE-AC05-84OR-21400; W-7405-ENG-26)
(DE85-001902; CONF-840793-1) Avail: NTIS HC A02/MF A01

A remotely maintainable force-reflecting servomanipulator concept is being developed at the Oak Ridge National Laboratory as part of the Consolidated Fuel Reprocessing Program. This new manipulator addresses requirements of advanced nuclear fuel reprocessing with emphasis on force reflection, remote maintainability, reliability, radiation tolerance, and corrosion resistance. The advanced servomanipulator is uniquely subdivided into remotely replaceable modules which will permit in situ manipulator repair by spare module replacement. Manipulator modularization and increased reliability are accomplished through a force transmission system that uses gears and torque tubes. Digital control algorithms and mechanical precision are used to offset the increased backlash, friction, and inertia resulting from the gear drives. This results in the first remotely maintainable force-reflecting servomanipulator in the world. DOE

N85-18346# Technical Research Centre of Finland, Espoo. Metals Lab.
MECHANICAL PROPERTIES OF SHIELDED METAL ARC (SMA) AND SUBMERGED ARC (SA) WELDED JOINTS FOR QUENCHED AND TEMPERED STEEL StE 470.
Martti Vilpas, Kim Wallin, Hannele Tihekari, and Risto Karppi Oct. 1984 30 p refs
(VTT-319; ISBN-951-38-2179-X) Avail: NTIS HC A03/MF A01; Technical Research Centre of Finland, Espoo FIM 30

Hardness, tensile, Charpy-V and fracture mechanics testing of shielded metal arc (SMA) and submerged arc welded joints are summarized. Results show satisfactory strength, toughness and transition behavior compared with the corresponding properties of the base material. The arc energy in the range 17 to 50 KJ/cm has no marked effect on the mechanical properties of the joints. The Charpy-V-transition temperatures lie in the range minus 40 to minus 60 C for the weld metals and minus 30 to minus 45 C for the fusion boundaries with arc energies 17, 30 or 50 KJ/cm. The KJ-transition behavior of the joints is almost independent of the arc energy. The SMA-welds show, however, brittle pop-in behavior at KJ-test temperatures, (minus 80 to +20 C) perhaps due to heterogeneity of the SMA-weld metals. Author (ESA)

N85-18347# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
DEFECT TOLERANCE IN PIPELINE GIRTH WELDS
P. Hopkins, D. F. Jones, and G. D. Fearnehough Mar. 1984 17 p refs Presented at 4th Natl. Congr. on Pressure Vessel and Piping Technol., Symp. on Behavior of Circumferential Cracks in Pressure Vessels and Piping (ASME), Oreg., Jun. 1983
(ERS-E.353) Avail: NTIS HC A02/MF A01

The definition of tolerable levels for defects in automatically welded girth welds for offshore application is discussed. Laboratory tests on defective samples and confirmatory full size bend/pressure tests give a relationship between stress level for failure and defect size. For ductile failure, the tests and complementary finite element stress analyses show that plastic collapse criteria adopted in published recommendations can be unnecessarily conservative. This is particularly so for the high stress levels which can occur during laying of offshore pipelines. An alternative defect acceptance level was proposed for this application. The result is a standard which has considerable benefit in offshore girth welding in permitting embedded planar defects equivalent to one weld pass depth. Author (ESA)

N85-18348# AiResearch Mfg. Co., Torrance, Calif.
OPEN-CYCLE CENTRIFUGAL VAPOR-COMPRESSION HEAT PUMP Annual Report, Mar. 1983 - Feb. 1984
T. L. Iles, L. R. Burgeier, and J. E. Stanko Apr. 1984 72 p Sponsored by Gas Research Inst.
(PB85-113405/GAR; GRI-84/0085) Avail: NTIS HC A04/MF A01 CSCL 13A

The design and an open-cycle high-lift contrifugal steam compressor system that can be efficiently retrofitted to existing multi-effect and high-temperature differential evaporators while maintaining the cost benefits of a single-stage centrifugal compressor are described. Test activities condusted to demonstrate the energy saving and cost benefits of driving the compressor with a natural-gas fueled gas turbine engine are report. The turbine exhaust will be used for final drying of the product that was evaporated. GRA

N85-18184# Yamaguchi Univ. (Japan). Dept. of Mechanical Engineering.
STUDIES ON REACTIVE MUFFLERS. PART 2: MUFFLERS WITH AIR FLOW
Motokazu Fukuda and Naoya Kojima *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 205-214 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

N85-18206# Joint Publications Research Service, Arlington, Va.
ON ONE DESIGN PRINCIPLE OF SURGE PROTECTOR FOR GAS TURBINE ENGINE COMPRESSOR Abstract Only
M. M. Shakiryanov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 17 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 97-99 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18209# Joint Publications Research Service, Arlington, Va.
IMPROVEMENT OF GAS TURBINE ENGINE PERFORMANCE BY WATER INJECTION INTO TURBINE COOLING AIR Abstract Only
G. M. Gorelov, V. P. Danilchenko, and V. Ye. Reznik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 19-20 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 19-20 Original language document was announced in IAA as A84-25569 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18211# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF INFLUENCE OF SIZE OF UPPER AND LOWER LAPS ON OPERATIONAL EFFICIENCY OF CENTRIPETAL FULL-INLET AIR DRIVEN MICROTURBINES Abstract Only
N. P. Tikhonov, A. N. Tikhonov, and S. M. Gracheva *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 21 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 42-46 Original language document was announced in IAA as A84-25562 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18213# Joint Publications Research Service, Arlington, Va.
CORRECTION OF ENGRAVING STAMP FOR FORMING BLANKS OF GAS TURBINE ENGINE BLADES Abstract Only
V. Yu. Zykov, A. F. Pavlov, L. T. Kazakova, and F. S. Yunusov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 22 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Aviats. Tekhn. (USSR), no. 3, Jul. - Sep. 1983 p 27-32 Original language document was announced in IAA as A84-25559 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18214# Joint Publications Research Service, Arlington, Va.
SPEED GOVERNOR FOR DIESEL ENGINE Abstract Only
Ye. Kh. Kadyshevich, M. A. Miselev, and N. N. Svistunov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 23 Transl. into ENGLISH from Sudostr. (Leningrad), no. 3, Mar. 1984 p 25-26 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18215# Joint Publications Research Service, Arlington, Va.
USE OF BRAKING STAGES FOR CONTROL OF TURBINE SPEED Abstract Only
Yu. M. Pogodin, A. M. Topunov, and A. I. Chernov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 23-24 Transl. into ENGLISH from Sudostr. (Leningrad), no. 6, Jun. 1984 p 20-22 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

N85-18228# Joint Publications Research Service, Arlington, Va.
DUTCH INSTITUTES DO RESEARCH IN TACTILE VISUAL ROBOT SENSORS
G. A. Schwippert and G. K. Steenvoorden *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 14-17 Transl. into ENGLISH from TNO Proj. (The Hague), Sep. 1984 p 340-342 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

N85-18229# Joint Publications Research Service, Arlington, Va.
SCANIA, ASEA OF SWEDEN USE ROBOTS FOR ALL PRODUCTION PHASES
Peter R. Muehlemann *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 18-26 refs Transl. into ENGLISH from Tech. Rundschau (Bern), 18 Sep. 1984 p 25; 27; 29 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-18349 Rensselaer Polytechnic Inst., Troy, N. Y.
NONDESTRUCTIVE CHARACTERIZATION OF SEMICONDUCTOR SURFACES AND INTERFACES Ph.D. Thesis
Bijan Davari 1984 251 p
Avail: Univ. Microfilms Order No. DA8426512

The introduction and development of characterization techniques which are in strong demand in today's semiconductor research environmental are presented. The techniques such as nondestructive measurements and new depth profiling procedure are developed. The implementataion of the new techniques and more conventional, already existing methods such as C-V, C-t in the study of critical semiconductor properties are also examined. The surface and interface characteristics of silicon and GaAs are investigated before and after the semiconductor has undergone a specific processing step. A brief listing of the work done on these semiconductors is presented. Dissert. Abstr.

N85-18350# Oak Ridge National Lab., Tenn.
EXPERIMENTAL VERIFICATION OF EDDY-CURRENT FLAW THEORY
C. V. Dodd, C. D. Cox, and W. E. Deeds 1984 6 p refs Presented at Progress in Quantitative NDE, San Diego, Calif., 8 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001288; CONF-840738-6) Avail: NTIS HC A02/MF A01

Carefully machined flaw samples in plates and tubes were examined with eddy current coils of accurately known dimensions. Both near and far side flaws werre measured using absolute and differential coil modes. The experimental data were compared with computer calculations based on the flaw theory of Burrows and the analytical solutions of Dodd and Deeds. The experimental and theoretical data are in good agreement whenever the flaw size is small compared to the other significant dimensions, but large enough to give a reasonable signal to noise ratio for the measuring instrument. The experimental and analytical readings are also used to check the flaw inversion theory. DOE

N85-18351# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
MODELING OF REAL UT TRANSDUCER FIELD/FLAW INTERACTIONS
B. A. Barna 1984 9 p refs Presented at Progress in Quantitative NDE, San Diego, Calif., 8 Jul. 1984
(Contract DE-AC07-76ID-01570)
(DE85-000341; EGG-M-20984; CONF-840738-7) Avail: NTIS HC A02/MF A01

The field/flaw interaction is modelled with an integration of the portion of the transducer field that is reflected by the flaw. Essentially, this is a short wavelength approximation in which the scattering due to the flaw is treated as a specular reflection back to the transducer. The system investigated was a vertical surface breaking crack being insonified with a refracted shear wave in an immersion tank. The model allows for the shape of the acoustic pulse wavefronts as they impinge upon the refracted surface of the crack sample. The model operates in the Fourier domain and assumes that a discrete Fourier transform is the input spectrum for the given transducer. The spectrum is then modified at each frequency by calculating what angular portion of the field is reflected by the flaw and what the reflection and transmission coefficients are for the angle of incidence on the surface of refraction. A comparison of the model prediction with experimental measurements is made. DOE

N85-18222# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF BLADE SERVICE LIFE UNDER IRREGULAR LOADING CONDITIONS Abstract Only
V. S. Sokolov and A. I. Lebedeva *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-001) 10 Jan. 1985 p 32-33 Transl. into ENGLISH from Teploenerg. (Moscow), no. 2, Feb. 1984 p 24-27 (For primary document see N85-18200 09-31)
Avail: NTIS HC A03

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N85-18352 Communications Research Centre, Ottawa (Ontario).
MODELLING AND IDENTIFICATION OF THE STRUCTURAL PROPERTIES OF AN ASTROMAST
Y. Soucy and F. Vigneron Nov. 1983 91 p refs
(CRC-1374) Avail: Issuing Activity

Analytical modeling and identification of static and dynamic (modal) parameters for an Astromast are described. The fundamental bending modes in the X and Y directions, three higher order transverse bending modes, and two modes in torsion, were identified in tests in the frequency range 1.8 to 46 Hz. The associated damping factors range between 1.2 and 8.5 percent. The factors associated with the fundamental bending and torsion

modes were found to be the same in vacuum and in air. No single configuration and technique was able to identify all of the modes; techniques involving base excitation with an electrodynamic exciter, base excitation with a hydraulic exciter, impact and step relaxation techniques were needed. The MODAL-PLUS software was used for parameter identification. It was observed to support impact and step relaxation testing fully, but to have limitations for the base excitation methods. The experimentally-identified modal frequencies were compared with results produced by a finite element model and a continuum model. M.G.

N85-18353 Iowa Univ., Iowa City.
FINITE ELEMENT COMPUTATION OF STRUCTURAL DESIGN SENSITIVITY ANALYSIS Ph.D. Thesis
Ren-Jye Yang 1984 210 p
Avail: Univ. Microfilms Order No. DA8423613

A unified finite element based design sensitivity analysis method using an adjoint variable technique is developed and analyzed for conventional and shape design problems. The variational formulation of the equations of structural mechanics is employed, through application of Sobolev space theory of functional analysis. The material derivative idea from continuum mechanics is employed for calculation of shape design sensitivity. The design sensitivity formulation for conventional design is validated through application bo beam, plate, plane elasticity, and two and three dimensional artificial joint implant problems. A new shape design sensitivity formulation that uses the characteristic function idea for an averaged stress constraint functional is presented. A smooth boundary parameterization is introduced to avoid the Babuska Paradox and to improve accuracy of esign sensitivity. A linearization method of optimization is used to obtain optimum shapes. Examples including a fillet, torque, arm, two dimensional dam, and engine connecting rod are analyzed and optimized. Dissert. Abstr.

N85-18354 Harvard Univ., Cambridge, Mass.
CIRCUMFERENTIAL CRACKS IN CYLINDRICAL SHELLS Ph.D. Thesis
Jacob Adeyemi Alabi 1984 68 p
Avail: Univ. Microfilms Order No. DA8419294

Analytical expressions for the stress intensity factor and the energy-release rate associated with circumferential cracks in cylindrical shells are examined. The derivations involve both part-through cracks and through-cracks and are carried out separately in two parts. The problem of an infinitely long cylndrical shell containing a circumferential part-through crack is solved by using the so-called line-spring model. The stress intensity factors are computed for a cylinder under tension and bending. The problem of a fixed cylinder with a through-crack at the fixed end is analyzed. Expressions for the energy-release rates are obtained for a cylinder subjected to tension and bending loading. The analyses are applicable to complete circular cylinders with sufficiently long cracks and are supplementary to similar investigations carried out for short cracks or other crack configurations. Dissert. Abstr.

N85-18355 Texas Univ., Austin.
A FINITE ELEMENT ANALYSIS OF VISCOELASTIC MATERIALS WITH VARYING TIME SCALES Ph.D. Thesis
Robert Spencer Chambers 1984 216 p
Avail: Univ. Microfilms Order No. DA8421676

The initial boundary value problem for isotropic viscoelastic materials that undergo small deformations and that exhibit a varying time scale in the material response functions is solved by a finite element analysis. Integral consitutive equations based on a reduced time variable that dependes on a free volume fraction which in general is a function of temperature, solvent concentration, and deformation are used with a Prony series representation of the relaxation moduli. The numerical solution is obtained by satisfying equilibrium equations at discrete points in time using difference formulae to model the rates of change in displacement, temperature, and solvent concentration. Dissert. Abstr.

N85-18356 Michigan Univ., Ann Arbor.
LARGE DEFORMATIONS OF A NONLINEAR ELASTIC SOLID AND THE DIFFUSION OF AN IDEAL FLUID TREATED AS INTERACTING CONTINUA Ph.D. Thesis
Mukesh Vashumal Gandhi 1984 109 p
Avail: Univ. Microfilms Order No. DA8422229

The pressure-induced steady-state diffusion of an ideal fluid through a highly deformable isotropic elastic solid was studied using the theory of interacting continua. Constitutive equations for the partial stresses and the interaction body force are presented. Two specific problems are udied: (1) diffusion of a fluid through a sheared and uniformly stretched plate; and (2) diffusion of a fluid through an axially stretched hollow cylinder. In the plate problem, in the absence of shear, the theory predicts the same form of the flux-pressure-difference relation as observed experimentally. It is also shown that shearing the plate reduces the flux for a given pressure-difference. The non-uniform variation of various kinematical quanitities quantities through the thickness was examined. In the cylinder problem the deformed outer surface is bonded to a rigid hollow porous cylinder. For a given pressure-difference it is shown that the flux increases with increasing axial stretch ratio, and with increasing deformed outer radius. Dissert. Abstr.

N85-18357 Virginia Polytechnic Inst. and State Univ., Blacksburg.
DESIGN ORIENTED IDENTIFICATION OF CRITICAL POINTS IN TRANSIENT RESPONSE Ph.D. Thesis
Ramana Venkata Grandhi 1984 120 p
Avail: Univ. Microfilms Order No. DA8421867

For many real vehicle design applications, the evaluation of constraints such as stresses requires a costly finite element analysis, and finding critical points by calculating element stresses for many time points can be prohibitively expensive. Three techniques for reducting the computational effort involved in identifying the critical time points are described. The first approach is an adaptive search technique, well suited for exactly known response. The second technique is based on approximating the stress response using spline techniques. Spline interpolation is suggested for exactly known transient response and least squares spline approximation is useful for noisy response. Third the possibility of grouping several ciosely spaced local peaks to identify a single super peak from each group is investigated. The error incurred due to super peak switching is compared with the errors due to commonly employed constraint approximations. Three example problems are considered to demonstrate the computational efficiency of the proposed techniques. Dissert. Abstr.

N85-18358 Iowa Univ., Iowa City.
TREATMENT OF GENERAL BOUNDARY CONDITIONS AND POINT-WISE STATE VARIABLE CONSTRAINTS IN OPTIMUM DESIGN FOR STATIC AND DYNAMIC RESPONSE Ph.D. Thesis
Ching-Chieh Hsien 1984 237 p
Avail: Univ. Microfilms Order No. DA8423569

The methods for design sensitivity analysis of static and dynamic response of structural systems when general boundary conditions are imposed during the analysis phase are presented. It is shown that they are applicable with any treatment of general boundary conditions. Two alternate treatments of point-wise state variable constraints - worst-case design and a hybrid formulations - are proposed, developed, and evaluated for optimization of dynamic response. The direct differentiation and adjoint variable methods of design sensitivity analysis to deal with the point - wise constraints are presented and compared. The computational optimization algorithms based on the efficient adjoint variable methods of new formulations are presented for optimal design of dynamic response and distributed parameter problems. It is concluded that the new worst-case design formulation works extremely well as precise optimum designs are obtained and the new hybrid formation works extremely efficient and converges to either optimal or near optimal solutions without any difficulty. Dissert. Abstr.

N85-18359 Nebraska Univ., Lincoln.
MECHANICAL AND TRANSIENT HYGROTHERMAL LOADING OF MULTILAYER ORTHOTROPIC CYLINDERS Ph.D. Thesis
Norman L. Newhouse 1984 170 p
Avail: Univ. Microfilms Order No. DA8423818

A method of solution for multilayer, multimaterial, orthotropic cylinders under static mechanical loading and transient hygrothermal loading was developed. Stresses, strains, and radial displacements are calculated under loading conditions of internal and external pressure, axial load or axial strain, rotation, and temperature and moisture profiles which are considered to be transient in nature. The transient temperature and moisture profiles are developed using a finite difference method. The environmental temperature and convection coefficients are allowed to vary with time. Physical properties are held constant. A method of solving for stresses, strains, and displacements in multilayered cylinders was developed using a unit displacement method. The validity and accuracy of the solutions for hygrothermal profiles and for stresses and strains were demonstrated by comparison with classical solutions and with solutions in the literature. Parametric studies were conducted conducted to demonstrate the versatility of the solutions which were developed. Dissert. Abstr.

N85-18360 Virginia Polytechnic Inst. and State Univ., Blacksburg.
IDENTIFICATION OF VIBRATION PARAMETERS OF FLEXIBLE STRUCTURES Ph.D. Thesis
Speeramuku Rajaram 1984 134 p
Avail: Univ. Microfilms Order No. DA8421888

Several identification methods to determine the best estimates of higher order strucutral models directly from on-orbit vibration experiments are examined. The methods presented are relatively immune to the presence of many low frequency modes with repeated or closely spaced natural frequencies, damping, and very high dimensionality. A time domain identification method using transient response, a steady state response method, and mass and stiffness parameters of a vibrating system from measured eigenvalues and eigenvectors were studied. All the methods are demonstrated via example problems. Numerical results are presented to study the effects of several implementation issues. Dissert Abstr.

N85-18361# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 16, NO. 10 Monthly Report
Judith Nagle-Eshleman, ed. Oct. 1984 97 p refs
(AD-A147588) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The analysis of sound propagation in ducts or waveguides is described along with linear and nonlinear analyses of free and forced vibrational modes of membranes. Abstracts from current structural/mechanical literature are presented. For individual titles, see N85-18362 through N85-18363.

N85-18362# Leeds Univ. (England). Dept. of Applied Mathematical Studies.
SOUND TRANSMISSION IN DUCTS c71
N. Romilly *In* Shock and Vibration Information Center The Shock and Vibration Digest, V. 16, No. 10 Oct. 1984 p 3-7 refs (For primary document see N85-18361 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/1

The analysis of sound propagation in ducts or waveguides is described. Membrane and thin plate models are summarized, as is the normal mode method. Double panels and the importance of the accuracy of the panel model are covered. Experimental work and directions for future research are discussed. Author

N85-18363# Adelaide Univ. (Australia). Dept. of Applied Mathematics.
A REVIEW OF APPROXIMATE METHODS FOR DETERMINING THE VIBRATIONAL MODES OF MEMBRANES
J. Mazumdar *In* Shock and Vibration Information Center The Shock and Vibration Digest, V. 16, No. 10 Oct. 1984 p 9-15 refs (For primary document see N85-18361 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Linear and nonlinear analyses of free and forced vibrational modes of membranes are described. The effects of such complicating factors as large amplitude vibrations, material anisotropy, dynamic loading, and disturbed forcing functions are also included. Practical applications of membranes and future research directions are addressed. R.S.F.

N85-18364 Georgia State Univ., Atlanta.
OPTIMIZATION OF VIBRATING BEAMS INCLUDING THE EFFECTS OF COUPLED BENDING AND TORSIONAL MODES Ph.D. Thesis
Aditi Chattopadhyay 1984 257 p
Avail: Univ. Microfilms Order No. DA8424618

The optimality criterion approach based on finite element techniques was proposed for the optimum design of vibrating beams undergoing transverse as well as couple bending torsion vibrations. The continuous beam was discretized using finite element techniques and the elemental areas have been treated as the design variables. The optimality condition was reduced to a relationship between the elemental strain energy densities and the kinetic energy densities corresponding to the first and the second natural modes of vibration. In the case of the transversely vibrating beams with simply supported boundary condition an attempt was also made to simultaneously maximize the values of the first two adjacent natural frequencies, without altering the volume of the structure. The optimal design of beams with thin walled cross sections, undergoing coupled bending and torsional vibrations were considered. In addition to solving the primal problem of frequency maximization, the dual problem of minimizing the volume of the beam was addressed. A channel beam with simply supported boundary condition and a specified fundamental frequency was considered. Dissert. Abstr.

N85-18365 Duke Univ., Durham, N. C.
EXTRPOLATION IN FINITE ELEMENT ANALYSIS Ph.D. Thesis
Abdulati Bubker Bolkhir 1984 126 p
Avail: Univ. Microfilms Order No. DA8423932

A method for self qualification of finite element analysis results by extrapolation is developed. Self qualification involves the process of adding to finite element analysis results, data which measures the discretization error. Self qualifying using extrapolation means using results of two or more analyses to provide measures of the accuracy of results of a particular finite element analysis. The method is based on scalar and a new matrix polynomial extrapolation theory and finite element models which exhibit monotonic convergence in the energy norm. Self qualification procedure is particularized for scalar and matrix extrapolation. Relevancy checks are defined. Applications of self qualification to beam and membrane problems show that accurate measures of discretization error can be obtained as long as round off error is well controlled. Dissert. Abstr.

N85-18366 Ohio State Univ., Columbus.
CORIOLIS EFFECTS ON THE VIBRATIONS OF ROTATING BEAMS, PLATES AND SHELLS Ph.D. Thesis
Chimin J. Co 1984 156 p
Avail: Univ. Microfilms Order No. DA8426373

Relatively little has been previously written which includes the effects of the Coriolis forces in the vibration analysis of rotating, cantilevered, structural elements, and considerable disagreement exists as to the importance of these effects. A generalization of the Ritz method, which includes all rotating dynamics effects is presented, and a straight forward procedure for incorporating out of phase Coriolis terms in the eigenvalue problem is demonstrated. Numerical results for the problems studied showed that Coriolis effects have significant effect upon the natural frequencies when the angular velocity component along the symmetry axis of the configuration becomes sufficient large. Dissert. Abstr.

N85-18367 State Univ. of New York, Buffalo.
ON SOME EXACT SOLUTIONS IN ELASTOSTATICS IN TERMS OF HARMONIC FUNCTIONS Ph.D. Thesis
Agha Jamal Ghorieshi 1984 70 p
Avail: Univ. Microfilms Order No. DA8426040

The recently developed method of finding the exact solution of three dimensional problems in elastostatics in terms of harmonic functions, is further explored and explained in this paper. To explain the techniques of the theoretical development four problems are solved: (1) Infinite, elastic, thick plate with traction-free parallel surfaces, (2) Infinite, elastic, thick plate on an elastic foundation, (3) Circular-crested displacement of a thick elastic plate, and (4) Flexural displacement of an infinte, elastic, prismatic circular cylinder with traction-free surface. It is shown that in each case the problem can be solved exactly in terms of harmonic functions, one of which is a scalar, and the other is a vector. The four problems chosen are those for which exact solutions are shown. In the available literature, by using a very special limiting procedure, only the limiting form of the eigenvalue equations are given. In each cae the xact solutions of the elastostatics problems can, in general, be obtained in a straight forward manner by the use of harmonic potentials, without recourse to any special limiting form of analysis. A new limiting procedure for completeness is included for a clearer understanding of the new development in the field of three dimensional theory of linear elasticity. Dissert. Abstr.

N85-18368 State Univ. of New York, Buffalo.
STRAIN-CONTROLLED CREEP RUPTURE IN NON-ISOTHERMAL MATERIALS Ph.D. Thesis
Ren-Jyh Gu 1984 122 p
Avail: Univ. Microfilms Order No. DA8426043

A simplified uniaxial strain-controlled creep damage law is deduced with the use of experimental observation from a more complex strain-dependent law. This postulated creep damage law correlates the creep damage, which is interpreted as the density variation in the material, directly with the accumulated creep strain. Utilizing both the effective and the maximum principal stress criteria, the uniaxial strain-controlled creep damage law is then generalized to multiaxial stress states. Continuum mechanical creep rupture analyses are carried out in detail for a plane-strain tube problem and for a beam problem with an elastic foundation, with temperature gradients present in both problems. The analyses include a determination of the location and nondimensional time of initial rupture, the propagation of the rupture front, the possible influence of rupture on the temperature profile, and the final collapse time of the structure. Dissert. Abstr.

N85-18369 Ohio State Univ., Columbus.
FINITE ELEMENT ANALYSIS OF BI-MATERIAL SYSTEMS WITH APPLICATIONS IN HYDRAULIC FRACTURING Ph.D. Thesis
Oguzman Gurdogan 1984 230 p
Avail: Univ. Microfilms Order No. DA8426395

Fractured homogeneous and multi-layered systems are studied by employing the theory of linear elastic fracture mechanics and the finite element numerical modelling techniques. For an accurate computation of fracture parameters such as the energy relese rate and the stress intensity factors, efficient numerical techniques are proposed and implemented. Path independent J and M integrals are studied for loaded interiacial and terminal cracks in bi-material media. The solution to the problem of a crack oriented perpendicular to and terminating at a bi-material interface is formulated in terms of the bi-material stress intensity factors. The maximum circumferential tensile stress criterion for homogeneous isotropic media is extended for interfacial and terminal cracks with emphasis on frictional effects and debonding of the interface. Corresponding fracture envelopes representing the possible modes of failure are presented. The fracture process zone for bi-material cracks is studied by analogy with the plastic zone for metals and extending the application to the case of microcrack zones with frictional effects for rock. Dissert. Abstr.

N85-18370 State Univ. of New York, Buffalo.
WAVE PROPAGATION IN PERIODIC, COMPOSITE STRUCTURES Ph.D. Thesis
Sen-Yung Lee 1984 50 p
Avail: Univ. Microfilms Order No. DA8426057

The problem of wave propagation in periodic, composite structures is of interest in a number of fields in physics and engineering. A general method of solution is developed which can be successfully applied to the general class of problem, governed by a vector partial differential equation with piecewise continuous coefficients and possessing separable solutions in each subdomain, irrespective of the number of layers or segments in one lattice cell of the structure. The problem of the coincidence was studied in detail. The dispersion spectrum, eigenfunctions, and catastrophic changes in the eigenfunction at the point of coincidence were also studied and sketched. Finally, the properties of the stability and liability regions are discussed and the characteristic properties of the Liapounoff-Haupt sequence are shown. Dissert. Abstr.

N85-18371 Ohio State Univ., Columbus.
THE FRACTURE MECHANICS OF A SLIT CRACK WITH CRACK-TIP DUAL ZONES Ph.D. Thesis
Arvind K. Nagar 1984 214 p
Avail: Univ. Microfilms Order No. DA8426444

An idealized analytic model for mode 1 cracking with crack-tip dual zones of an elastic core zone and a plastic strip zone is proposed. It is assumed that the material in the elastic core zone obeys stress-strain relations of linear elasticity and that the normal displacement across the crack face possesses a jump of uniform value there. The plastic strip zone is a zone of Dugdale plastic yielding with negligible strain-hardening. With the condition of boundedness of stresses in the plastic zone, the analytic results for the stress and displacement fields are derived. Based on these results, an inverse square root of stress singularity occurs at the crack-tip and a relaxation of stresses in the crack-tip elastic zone is realized. Stress distributions, the crack-tip stress-intensity factor, the crack-opening displacements, the dual-zone lengths, and the crack-face displacement profiles are obtained. Dissert. Abstr.

N85-18372 Georgia Inst. of Tech., Atlanta.
EXISTENCE, UNIQUENESS AND STABILITY CONDITIONS FOR GENERAL FINITE ELEMENT METHODS IN LINEAR ELASTICITY Ph.D. Thesis
Wie-Min Xue 1984 183 p
Avail: Univ. Microfilms Order No. DA8425186

The theory of a simple saddle-point problem due to Brezzi, and the work of Ying and Atluri on the Stokes flow problem, are extended to the more interesting case of a simultaneous saddle-point problem which includes more than two Lagrange multipliers. The estimates of error, and the influence of numerical integration, are summarized. Through more rigorous considerations of the four types of treatment of the displacement compatibility and traction reciprocity conditions at interelement interfaces, the abstract variational statements are derived for the modified potential energy principle, the modified complementary energy principle, modified Hellinger-Reissner type principles, and modified general Hu-Washizu type principles, in linear elasticity. These abstract statements, in fact, are weak forms of original governing partial differential equations, and interface and/or boundary conditions. The ellipticity condition and stability conditions which are sufficient for the existence, uniqueness, convergence, and stability property of the approximation solutions, are derived for various mixed-hybrid models based on these variational principles. Dissert. Abstr.

N85-18373 Ohio State Univ., Columbus.
NONLINEAR FINITE ELEMENT ANALYSIS OF ELASTIC AND ELASTIC-PLASTIC BUCKLING OF CYLINDERS UNDER COMPLEX COMBINED LOADS Ph.D. Thesis
Jami Jamshed Shah 1984 282 p
Avail: Univ. Microfilms Order No. DA8426477

The total Lagrangian system based on the potential energy method is used to formulate the governing finite element equations. Large displacement shell elements are adapted to cylinderical geometry and degenerated by forcing Kirchhoff's assumptions for

thin shells. Constitutive matrices are based on linear, isotropic stress-strain relations in the elastic range and ductile, isotropically work-hardening flow rule in the plastic range. An incremental theory of plasticity is used and hardening indices are based on three different material models. Use of the Second Piola-Kirchhoff stress tensor and the Green-Lagrange strain tensor allows modelling of large displacements and rotations. A quasi-Newton scheme is used for solving the nonlinear equations, with the stiffness matrix being updated only once per loadstep to reduce computations. The linear equation solver is based on LDL(T) decomposition; a skyline algorith is used. Dissert. Abstr.

N85-18374 National Physical Lab., Teddington (England). Div. of Materials Applications.
COMPARISON OF PROPERTY REGENERATION TECHNIQUES AND LIFE PREDICTION PROCEDURES APPLIED TO LABORATORY TESTED AND SERVICE EXPOSED Ni-Cr ALLOYS Final Report
M. McLean and M. S. Peck Oct. 1984 52 p refs
(NPL-DMA(A)91; ISSN-0143-7313) Copyright. Avail: Issuing Activity

Creep data for IN738LC at 750, 850 and 950 C are reported. Damage accumulation during creep testing was characterized and it is shown that fracture occurs by the development of internal grain boundary damage, largely in the final 10% of life, and not by the growth of surface cracks. Comparison of electron beam remelted alloy with the conventional material shows no significant differences in creep performance although there are detailed differences in damage distribution. In conditions giving 1000 hr lives at 750, 850 and 950 C, overaging leads to a significant reduction in rupture life; however, there is little effect at any of these temperatures in 10,000 hr tests. Hot isostatic pressing (HIP) is effective in removing creep cavitation and leads to partial regeneration of creep performance when the HIP surface is removed before retesting. Examination of service retired rotor blades from an industrial gas turbine show little evidence of creep damage. Author (ESA)

N85-18375*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA LEWIS RESEARCH CENTER/UNIVERSITY GRADUATE RESEARCH PROGRAM ON ENGINE STRUCTURES
Christos C. Chamis 1985 18 p Presented at the 30th Intern. Gas Turbine Conf. and Exhibit, Houston, Tex., 17-21 Mar. 1985; sponsored by ASME
(NASA-TM-86916; E-2393; NAS 1.15:86916) Avail: NTIS HC A02/MF A01 CSCL 20K

NASA Lewis Research Center established a graduate research program in support of the Engine Structures Research activities. This graduate research program focuses mainly on structural and dynamics analyses, computational mechanics, mechanics of composites and structural optimization. The broad objectives of the program, the specific program, the participating universities and the program status are briefly described. Author

N85-18376*# Wyoming Univ., Laramie. Dept. of Mechanical Engineering.
VERIFICATION AND APPLICATION OF THE IOSIPESCU SHEAR TEST METHOD Technical Report, Jun. 1983 - May 1984
David E. Walrath and Donald F. Adams Jun. 1984 119 p refs (Grant NAG1-272)
(NASA-CR-174346; NAS 1.26:174346; UWME-DR-401-103-1) Avail: NTIS HC A06/MF A01 CSCL 20L

Finite element models were used to study the effects of notch angle variations on the stress state within an Iosipescu shear test speciment. These analytical results were also studied to determine the feasibility of using strain gage rosettes and a modified extensometer to measure shear strains in this test specimen. Analytical results indicate that notch angle variations produced only small differences in simulated shear properties. Both strain gage rosettes and the modified extensometer were shown to be feasible shear strain transducers for the test method. The Iosipoescu shear test fixture was redesigned to incorporate several improvements. These improvements include accommodation of a 50 percent larger specimen for easier measurement of shear train, a clamping mechanism to relax strict tolerances on specimen width, and a self contained alignment tool for use during specimen installation. A set of in-plane and interlaminar shear properties were measured for three graphite fabric/epoxy composites of T300/934 composite material. The three weave patterns were Oxford, 5-harness satin, and 8-harness satin. R.S.F.

N85-18377# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN 54. PART 1: WELCOME, KEYNOTE ADDRESS, INVITED PAPERS MIL-STD-810D, MIL-STD-810D PANEL SESSION Monthly Report
Jun. 1984 132 p refs Proceedings of the 54th Symp. on Shock and Vibration, Pasadena, Calif., 18-20 Oct. 1983 3 Vol.
(AD-A148131; SVIC-Bull-54-Pt-1) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Various problems related to shock and vibration effects on intercontinental ballisti missiles, manned spacecraft, mobile missile launchers, and submarines are discussed. Structural dynamics, vibration simulation, and machinery dynamics are discussed. For individual titles, see N85-18378 through N85-18387.

N85-18378*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
KEYNOTE ADDRESS
Robert S. Ryan *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 3-21 refs (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Shock and vibration research relative to manned spacecraft is surveyed. Past, present, and future research projects are discussed. Dynamic response, structural modeling, rotor dynamics, reliability, large space sttructures, and testing are among the topics discussed. R.J.F.

N85-18379# Defense Nuclear Agency, Washington, D.C.
INVITED PAPERS: DNA ICBM TECHNICAL R AND D PROGRAM c14
Maxim I. Kovel *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 23-41 refs (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 14/2

The activities of the Defense Nuclear Agency, missile silo hardening, and mobile missile launcher hardening are discussed. The process of evaluating silo design and basing is explained. Mobile basing, hardening, and validation is discussed. The effects of nuclear blasts are discussed. R.J.F.

N85-18380# Army Missile Command, Redstone Arsenal, Ala.
SOME DYNAMICAL ASPECTS OF ARMY MISSILE SYSTEMS c15
James J. Richardson *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 43-53 (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 16/4

Dynamic loading in missile systems and its effect on missile performance are discussed. The Viper, Hellfire, and Hawk missiles are considered. R.J.F.

N85-18381# Air Force Space Technology Center, Kirtland AFB, N. Mex.
AIR FORCE SPACE TECHNOLOGY CENTER SPACE TECHNOLOGY: EMPHASIS 84 c14
Frank J. Redd *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 55-57 refs (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 14/2

The space technology planning and management efforts of the Air Force Space Technology Center at Kirtland Airforce Base, New Mexico, are discussed. Efforts in the areas of onboard processing, satellite control, spacecraft power supplies, and strategic surveillance are reviewed. R.J.F.

N85-18382# NKF Engineering Associates, Inc., Vienna, Va.
REFLECTIONS ON TRENDS IN DYNAMICS: THE NAVY'S PERSPECTIVE
Henry C. Pusey *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 59-64 refs (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The challenges inherent in meeting the combat demands of naval warships are discussed from a design engineering and dynamics standpoint. Attention is focused upon mechanical shock, shock tests, shock design, shock spectra, shock measurement, and shock isolation. The status of ship shock problems and the programs designed to solve them is assessed. Future work required on ship shock is outlined. R.S.F.

N85-18383# Lockheed Missiles and Space Co., Palo Alto, Calif.
ELIAS KLEIN MEMORIAL LECTURE: MODAL TESTING, A CRITICAL REVIEW
Strether Smith *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 65-75 (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Modal analysis, the characterization of the dynamic behavior of a structure in terms of its normal modes, is discussed. The theory underlying modal analysis is considered. The available modal testing options are reviewed. Excitation functions, multifrequency functions, and sinusoidal excitation are addressed. R.S.F.

N85-18384# Martin Marietta Corp., Denver, Colo.
SOLUTIONS TO STRUCTURAL DYNAMICS PROBLEMS
G. Morosow *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 77-82 refs (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The admixture of dynamic structural analysis and computer programming is discussed. Structural engineering challenges and software tools capable of addressing them are considered. R.S.F.

N85-18385# Westinghouse Electric Corp., Baltimore, Md.
ACCELERATION RESPONSES OF TYPICAL LRU'S SUBJECTED TO BENCH HANDLING AND INSTALLATION SHOCK
H. Caruso and E. Szymkowiak *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 91-99 refs (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A typical LRU (line replaceable unit) was studied to determine the levels of shock associated with the bench handling edge drop tests described in Mil-Std-810C/D. Three LRU's mounted on slide rails were examined to determine the shock resulting from typical seating operations during installation. The 4 inch drops made during the bench handling tests produced levels from 94 to 250 peak g's with durations up to 8 milliseconds. Energy was concentrated in the 50 to 300 Hz frequency band, a region of particular importance for typical LRU structures. Installation shock pulses ranged from 5 to 16 g's. Peak responses measured for bench handling and installation shocks represent an energy input between that associated with the traditional basic design and crash safety shock tests of Mil-Std-810C. Special attention should be given to those classes of equipment which are not normally thought of as encountering significant shock or vibration environments in end use or mission application. R.S.F.

N85-18386# Hughes Aircraft Co., El Segundo, Calif.
IMPACT OF 810D ON DYNAMIC TEST LABORATORIES
Allen J. Curtis *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 101-111 (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Impacts of specific test methods; facilities; computerization; skill levels; safety; environmental engineering; and test plans and procedures are discussed. B.G.

N85-18387# Aberdeen Proving Ground, Md.
THE CHANGING VIBRATION SIMULATION FOR MILITARY GROUND VEHICLES
Jack Robinson *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 1 Jun. 1984 p 113-124 (For primary document see N85-18377 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Changes in the vibration simulation for military ground vehicles, the impact of these changes, and what is needed to adequately accommodate them are discussed. B.G.

N85-18388# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN 54. PART 2: SHIP SHOCK, SHOCK AND BLAST AND GROUND SHOCK Monthly Report
Jun. 1984 253 p refs Proceedings of the 54th Symp. on Shock and Vibration, Pasadena, Calif., 18-20 Oct. 1983 3 Vol.
(AD-A148132; SVIC-Bull-54-Pt-2) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Investigations of shipboard shock response are reported. General shock phenomena are also discussed. For individual titles, see N85-18389 through N85-18405.

N85-18389# Pennsylvania State Univ., University Park.
TWO-DIMENSIONAL SHOCK RESPONSE OF A MASS ON ENERGY-ABSORBING SHOCK MOUNTS
R. E. Fortuna and V. H. Neubert *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 1-12 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5840, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Results of experimental and analytical studies of side-loaded, annealed, low carbon steel rings used as shock mounts are presented. The two-inch diameter rings were driven deep into the plastic range, with deformation in each direction up to 70 to 80 per cent of the ring diameter. Theoretical solutions in the plastic range exist only for the rings in compression. The load-deflection curves for side-loaded rings or tubes were compared with those for axially-loaded tubes, aluminum honeycomb, and a double-reverse corrugated metal. An advantage of the side-loaded tubes is that the load-deflection curves are almost flat after yielding occurs. Axially-loaded tubes and honeycomb show an initial high peak and a subsequent sharp drop-off in load, associated with buckling. Dynamic test results for the side-loaded rings under one-dimensional loading in compression, obtained in a drop-table shock machine are also presented. Attenuation of transmitted acceleration similar to that achieved with Aeroflex mounts was achieved with only about half the rattle space required because of the permanent deformation of the side-loaded rings. B.W.

N85-18390# Firestone Tire and Rubber Co., Akron, Ohio. Central Research Lab.
OPTIMUM DESIGN FOR NONLINEAR SHOCK MOUNTS FOR TRANSIENT INPUTS
K. Kasraie and V. H. Neubert (Pennsylvania State Univ., University Park) *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 13-28 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The state space method for optimal design of vibration isolators is used and advanced to include a more general class of problems encountered in the optimal design of shock absorbers. In contrast to the State Space Optimization, in which forcing functions, cost function and performance constraints are explicity independent of the state variable vector at some floating boundaries, in the new formulation of the problem, forcing functions, cost function and performance constraints can be a function of the state variable vector at some moving boundaries. Sixteen different shock absorbers with viscous damping and a bit linear spring are designed for optimum response to a shock of finite duration imposed by the supporting base. The objective of the design is to determine the value of damping (C) and elastic and plastic stiffness of the bilinear spring (k sub eK sub p) such that the absolute value of the maximum absolute acceleration is minimum, while the maximum relative displacement of the mass M is less than a specified value. B.W.

N85-18391# Royal Netherlands Navy, The Hague.
THE DEVELOPMENT OF A METHOD FOR THE SHOCK-RESISTANT SECURING OF LARGE BATTERIES IN SUBMARINES
A. Jansen *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 29-42 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Test results of an adhesive material (polyurethane) for bonding a hook-construction to the deck and the battery, to prevent the upwards movement of large batteries in a submarine during an underwater explosion are presented and discussed. This bonding method can be a powerful tool in specific situations for reducing (labor) cost, to improve the shock resistance and for simplification of structures. B.G.

N85-18392# Institute TNO for Mechanical Constructions, Delft (Netherlands).
SHIPBOARD SHOCK RESPONSE OF THE MODEL STRUCTURE DSM: EXPERIMENTAL RESULTS VERSUS RESPONSES PREDICTED BY EIGHT PARTICIPANTS
R. Regoord *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 43-66 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The Netherlands naval shipbuilding specifications for shipboard equipment require a certain resistance against the effect of noncontact underwater explosions. Results of shock tests to a simple structure are presented. These results may be useful for the renewal of shock design specifications of naval equipment which must resist the shock of underwater explosions. B.G.

N85-18393# Naval Surface Weapons Center, White Oak, Md.
DIRECT ENERGY MINIMIZATION APPROACH TO WHIPPING ANALYSIS OF PRESSURE HULLS
Kenneth A. Bannister *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 67-86 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The large deformation behavior of cylindrical shells executing low frequency, but large amplitude, whipping-type vibrations is examined. This problem is important in the practical design of cylindrical shell structures to resist failure due to in-services bending loads combined with pressure. A mathematical method is described which deals with such nonlinear shell analysis problems. B.G.

N85-18394*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WATER IMPACT LABORATORY AND FLIGHT TEST RESULTS FOR THE SPACE SHUTTLE SOLID ROCKET BOOSTER AFT SKIRT
D. A. Kross, N. C. Murphy (United Space Boosters, Inc., Huntsville, Ala.), and E. A. Rawls (Chrysler Corp., New Orleans) *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 87-98 (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A series of water impact tests was conducted using full-scale segment representations of the Space Shuttle Solid Rocket Booster (SRB) aft skirt structure. The baseline reinforced structural design was tested as well as various alternative design concepts. A major portion of the test program consisted of evaluating foam as a load attenuation material. Applied pressures and response strains were measured for impact velocities from 40 feet per second (ft/s) to 110 ft/s. The structural configurations, test articles, test results, and flight results are described. Author

N85-18395# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
AN OBJECTIVE ERROR MEASURE FOR THE COMPARISON OF CALCULATED AND MEASURED TRANSIENT RESPONSE HISTORIES
Thomas L. Geers *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 99-108 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A simple error measure is proposed for the objective comparisoin of a calculated transient response history with its measured counterpart. The measures assigns a single numerical value to the discrepancy between the two histories over a specified comparison period. Computation of the measure involves the integration in time of squares and/or products of the calculated and measured histories. Representative results are shown for both idealized and actual response histories. Author

N85-18396# Sandia Labs., Albuquerque, N. Mex.
ALTERNATIVE SHOCK CHARACTERIZATIONS FOR CONSISTENT SHOCK TEST SPECIFICATIONS
Thomas J. Beca *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 109-130 refs Previously announced as N84-13619 (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Three methods of analyzing transient acceleration time histories which represent promising alternatives to shock response spectra as the basis for deriving consistent shock test specifications were evaluated. The limitations of shock spectra are discussed. The shock analysis techniques include: (1) ranked peaks in the acceleration time history; (2) root mean square acceleration as a function of time; and (3) root mean square acceleration as a function of frequency. These shock characterizations provide the parameters necessary to develop a new shock test specification technique. The new method of shock test specification is demonstrated using drop table and decaying sinusoid shock test inputs. Test specifications using the standard method of shock spectrum enveloping are also derived. Beneficial aspects of utilizing these alternative shock anaysis techniques instead of shock spectra are presented and the evaluation of conservatism associated with different shock test specification techniques is emphasized. Author

N85-18397# Morrow (Charles T.), Encinitas, Calif.
SHOCK RESPONSE ANALYSIS BY PERSONAL COMPUTER USING THE EXTENDED IFT ALGORITHM
Charles T. Morrow *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 131-142 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The development of the indirect Fourier transform (IFT) algorithm for spectral analysis and shock response analysis is discussed. Response analysis by computer for single- and multiple-degree-of-freedom systems, with specific mathematical

development through two degress is reported. It is recommended that description and specification of a shock be accomplished by the undamped residual shock spectrum. The IFT algorithm implemented on a personal computer are described. It is recommended that response computation carried out by a computer with stored programs for various configurations of interest, to permit convenient exploration of benefits of proposed design changes in shock transmission paths. Exension of the IFT algorithm allows a personal computer to compute and display responses of an arbitray mechanical system to shock excitation. In multiple-degree-of-freedom systems, it is possible for the response to increase after shock termination, to levels that may cause failure or malfunction. The computer displays the plot duration, the extreme values for the plot, the difference between them, and a fatigue factor that is an indication of the number of cycles of increasing stress. This display is referred to as the fatigue summary. E.A.K.

N85-18398# New Mexico Univ., Albuquerque.
LEAST FAVORABLE RESPONSE OF INELASTIC STRUCTURES
Fashin Craig Chang, Thomas L. Paez, and Frederick Ju *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 143-154 refs Previously announced as N84-18687 (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

In the design of a structural system, a test input is sought to conservatively represent an ensemble of measured field inputs. When a structure survives the test input, it is assumed that it would survive the field inputs. The method of shock response spectra is a technique for specifying conservative test inputs, but it has some disadvantages. In this investigation a technique is developed for the specification of test inputs. It is based on the method of least favorable response, and it overcomes some of the shortcomings of the method of shock response spectra. Numerical examples show that the present technique can be used in practical applications. Author (GRA)

N85-18399# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
EXPERIMENTAL INVESTIGATION OF VIBROIMPACT OF TWO CANTILEVER BEAMS
C. N. Bapat and S. Sankar *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 165-176 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washginton, D.C. 20375 CSCL 20/11

The damping effect of collisions which occur at only one point along the length between two cantilever beams in free and forced vibrations was investigated. In forced vibrations with one sided clearance, displacement amplitudes were reduced considerably when the resonant frequencies of beams differed. The performance with steel stud and a neoprene pad looked like that of a highly dampled system with positive shift in the resonant frequencies. The maximum displacement amplitude with steel stud was approximately 25% smaller than that for the neoprene pad. However, the noise level, on average, was 10 dBA higher. The forced vibration response with two sided clearance looked like that of a single oscillator and displacement amplitudes were larger than that with one sided clearance. The tip of the beam as an impact point and smallest possible one sided clearance produced minimum displacement amplitudes in the forced vibrations and fastest decay of displacement in the free vibrations. E.A.K.

N85-18400# Naval Surface Weapons Center, White Oak, Md.
MODELS FOR SHOCK DAMAGE TO MARINE STRUCTURAL MATERIALS
David W. Nicholson *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 177-182 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Various types of strain rate embrittlement which may occur in marine structural materials under shock loading are discussed. A constitutive model is sketched which illustrates how material flow and damage are measured, heir thresholds, how they compete to dissipate available elastic and kinetic energy, and conditions under which their governing processes become unstable. E.A.K.

N85-18401# Beijing Inst. of Strength and Environment Engineering (China).
A STUDY OF THE EFFECT OF MASS LOADING ON THE SHOCK ENVIRONMENT c33
Qi-Zheng Wang and Hua-Bao Lin *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 183-192 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The weight variations in mounted subassemblies have relatively little effect on the pyrotechnic shock environment at the mounting point. This is the so-called mass loading effect. A mechanical model which attempts to explain theoretically the mechanism of the mass loading effect is given. A drop test and a structural striking test are conducted to simulate the pyrotechnic shock. The experimental results agree well with the predictions of the model analysis. A local and an entire body shock environment of a system and their shock test specifications are briefly discussed. R.J.F.

N85-18402# Aerospace Corp., El Segundo, Calif. Energy and Resources Div.
ASSESSMENT OF SEISMIC SURVIVABILITY
Robert E. McClellan *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 193-202 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Methods which account for real non-linear material and structure properties, as well as the effects of previous earthquakes on structure ductility, are demonstrated in application to high-rise buildings, and inferences regarding the effect of some commonly used structural details on seismic survivability of hith-rise buildings are discussed. The 1971 San Fernando earthquake showed that modern civil-architectural structures, designed to the same legal code requirements, can have seismic survivabilities which vary from near 100% to exactly zero. codified aseismic design procedures (however disguised as dynamics) actually use static lateral loads with assumed linear properties for materials and structures. Rigorous assessment of seismic survivability, although not required by existing codes for civil-architectural structures, is possible by rational analytical methods which enable derivation of a structure's time history of distortion when it is subjected to base motion of given displacement time history. R.J.F.

N85-18403# Aerospace Corp., El Segundo, Calif. Energy and Resources Div.
GROUND SHOCK EFFECT ON SOIL FIELD INCLUSIONS
R. E. McClellan *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 203-208 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The displacement response of a high density inclusion to ground shock is different from that of the surrounding soil field. An expression for inclusion-soil field peak relative displacement is derived in terms of the soil, inclusion, and ground shock parameters of interest. The magnitude of peak relative displacement is examined using reasonable values of soil and inclusion parameters, and for ground shock strengths commensurate with hardened design against nuclear weapons effects. It is found that high density inclusion ground shock responnse displacement can be large enough to damage or cut nearby buried power or communication cables responding with the soil field. Author

N85-18404# Applied Research Associates, Vicksburg, Miss.
PENETRATION OF SHORT DURATION AIRBLAST INTO PROTECTIVE STRUCTURES
J. R. Britt and J. L. Drake *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 209-222 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A combined analytical and experimental effort to study blast wave propagation into the interior of rooms from short duration airblast produced by conventional weapons detonated near entrances to these facilities is described. Twenty-seven small-scale high-explosive tests were conducted to study the effects of opening size, incident blast pulse duration, and peak pressure levels on the blast transmitted into structures. Two structures with square openings were used in the program. Peak entrance pressures ranged from 0.07 to 1.5 MPa (10 to 220 psi). A computer code-CHAMBER-was developed based upon a modified ray theory combined with empirical formulae derived from the experiment and nonlinear shock propagation and shock on shock addition rules to describe code was incorporated to account for the quasi-steady flow. The CHAMBER code represents the end product of the analysis of over 300 records of blast inside the test structures. Camparisons of calculated waveforms using CHAMBER with measurements are given. R.J.F.

N85-18405# Naval Civil Engineering Lab., Port Hueneme, Calif.
PRELIMINARY DESIGN CRITERIA AND CERTIFICATION TEST SPECIFICATIONS FOR BLAST RESISTANT WINDOWS
G. E. Meyers, W. A. Keenan, and N. F. Shoemaker *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 2 Jun. 1984 p 227-255 refs (For primary document see N85-18388 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Preliminary design criteria for blast resistant windows exposed to blast overpressures up to 25 psi are recommended. Design procedures and design curves for fully tempered glass are presented and parameterized according to glass thickness, glass dimensions, glass aspect ratio, peak blase overpressures and effective blast duration. Curves for annealed glass are also presented for the purpose of analyzing the safety of existing structures. Design criteria for frames and a test certification procedure are also discussed. Additionally, design examples are presented. Author

N85-18406# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN 54. PART 3: STRUCTURAL DYNAMICS, MACHINERY DYNAMICS AND VIBRATION PROBLEMS Monthly Report
Jun. 1984 155 p refs Proceedings of the 54th Symp. on Shock and Vibration, Pasadena, Calif., 18-20 Oct. 1983 3 Vol.
(AD-A148133; SVIC-Bull-54-Pt-3) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Developments in shock mechanics and vibration measurements and tests are reported. Topics include: structural dynamics, machinery dynamics, and vibration problems. For individual titles, see N85-18407 through N85-18422.

N85-18407# Anatrol Corp., Cincinnati, Ohio.
STRUCTURAL MODIFICATIONS BY VISCOELASTIC ELEMENTS
Paul J. Riehle *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 1-10 refs (For primary document see N85-18406 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A modeling technique which predicts the reduction in vibration transmitted from one structure to another through a viscoelastic isolation systems is described. Analytical or experimental representations of structure compliances and viscoelastic element stiffness and damping values are used in theee analysis. Predicted results of an isolation system are presented and compared to experimentally obtained results. E.A.K.

N85-18408# Chinese Academy of Sciences, Peking. Inst. of Mechanics.
STOCHASTIC DYNAMIC ANALYSIS OF A STRUCTURE WITH FRICTIONAL JOINTS
Qian-Li Tian, Yu-Bio Liu, and Da-Kang Liu *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 11-18 refs (For primary document see N85-18406 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A statistical linearized method for the analysis of the dynamic response of a structure with frictional joints is presented. It is assumed that the structure is excited by a stationary stochastic process with Gaussian distribution and the statistical linearization is made to transform the frictional forces to equivalent viscous damping forces. A localized damping modification method is used to calculate its response spectrum and corresponding statistical characteristics. E.A.K.

N85-18409# Texas Technological Univ., Lubbock. Dept. of Mechanical Engineering.
MODAL ANALYSIS OF STRUCTURAL SYSTEMS INVOLVING NONLINEAR COUPLING
R. A. Ibrahim, T. D. Woodall, and H. Heo *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 19-28 refs (For primary document see N85-18406 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A nonlinear analysis of the interaction of te normal modes of a three degree-of-freedom structure is presented. The asymptotic approximation method, due to Struble, is employed to solve for the structure response under harmonic excitation. Several possible autoparametric resonance conditions are predicted, and the investigation is confined to the time domain response in the neighborhood of the internal resonance conditions omega sub i = the absolute value of (omega sub J + or - omega sub k), where omega sub i, omega sub J, and omega sub k are three normal mode frequencies. For these internal resonance conditions the structure achieves a quasisteady state response. The transient response reveals peak amplitudes of almost 2.3 times the quasistate amplitude for the nonexcited modes. An exchange of energy between the excited mode and the nonexcited modes is noticed. E.A.K.

N85-18410# Ibaraki Univ., Hitachi (Japan).
DISCRETE MODIFICATIONS TO CONTINUOUS DYNAMIC STRUCTURAL SYSTEMS
Yohji Okada, Bo Ping Wang (Texas Univ., Arlington), and Wlater D. Pilkey (Virginia Univ., Charlottesville) *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 29-34 refs (For primary document see N85-18406 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The problem of introducing discrete elements such as springs or masses continuous dynamic systems is considered. A method is developed for the efficient analysis of such modified systems. After a transfer matrix analysis of the original system, appropriate transfer matrices are condensed and stored. Then the effect of the discrete modifications is introduced. The proposed technique is applied to a helicopter model. E.A.K.

N85-18411# Texas Univ., Arlington. Dept. of Mechanical Engineering.
REANALYSIS OF CONTINUOUS DYNAMIC SYSTEMS WITH CONTINUOUS MODIFICATIONS
Bo Ping Wang, Yohji Okada (Ibaraka Univ., Hitachi, Japan), and Walter D. Pilkey (Virginia Univ., Charlottesville) *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 35-42 refs (For primary document see N85-18406 09-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C.

20375 CSCL 20/11

Formulations are presented for the efficient analysis of dynamic systems with discrete and continuous local modifications. It is assumed that the original (unmodified) system was analyzed by a transfer matrix method with appropriate response information saved. The effect of introducing modifications can then be determined efficiently using a reanalysis procedure. The proposed technique is applied to a beam type structure. The purpose of a reanalysis formulation is to provide an analysis capability for a modified system for hich the complexity depends on the number of modifications rather than on the degrees of freedom of the original system. A reanalysis capability permits efficient parametric studies to be performed in which the effect of variations in portions of a structure is determined. R.J.F.

N85-18412# Polytechnic of Central London (England).

A POLE-FREE REDUCED-ORDER CHARACTERISTIC DETERMINANT METHOD FOR LINEAR VIBRATION ANALYSIS BASED ON SUB-STRUCTURING

B. Dawson and M. Davies (Surrey Univ., Guildford, England) *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 43-50 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A general method of solution for the linear vibration analysis of structures is presented. The method is based on substructuring and the formation of a reduced-order characteristic determinant whose zeros yield all the natural vibration frequencies of the system. The concept of the method and its application is illustrated via the determination of the torsional natural frequencies of engine-driven systems involving both discrete and continuous components. Author

N85-18413# Westinghouse Electric Corp., West Mifflin, Pa. Atomic Power Lab.

DETERMINATION OF SHEAR COEFFICIENT OF A GENERAL BEAM CROSS SECTION BY FINITE ELEMENT METHOD

C. M. Friedrich and S. C. Lin *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 51-58 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A finite element method is formulated to determine the distribution of warping deflections of a general cross section of a beam under a shear load. Then, formulae for the shear stresses, shear strains, shear stiffness, and shear coefficient are obtained in terms of the warping deflections. Numerical values of the shear stresses and shear coefficients are computed for four beam cross sections and compared with values obtained by other writes or by approximate solutions. Author

N85-18414# Westinghouse Electric Corp., Sunnyvale, Calif. Marine Div.

GEAR CASE VIBRATION ISOLATION IN A GEARED TURBINE GENERATOR

Robert P. Andrews *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 59-66 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The design and analysis of a flexible gear case mount system for a geared turbine generator is presented. The mount system isolates gear case vibration and allows the gear bearing loads to be equalized. The primary excitation frequencies to be isolated are the pinion rotational harmonics. Dynamic mathematical modeling was used to determine the proper mount flexibility relative to the inertia properties and flexibility of the system components. Damping is not considered in this analysis. Important design constraints discussed include mount stresses, system alignment requirements, and system vibration excitation frequencies. A snubber system was designed to limit vertical and athwartship deflections of the mount elements to prevent yielding under shock load conditions. Author

N85-18415# Concordia Univ., Montreal (Quebec). Dept. of Mechanical Engineering.

EFFECT OF COUPLED TORSIONAL-FLEXURAL VIBRATION OF A GEARED SHAFT SYSTEM ON THE DYNAMIC TOOTH LOAD

S. V. Neriya, R. B. Bhat, and T. S. Sankar *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 67-76 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The dynamic load on gear teeth is studied considering the coupling between the flexural and torsional vibrations in a simple geared shaft system. The flexibility of the mating teeth and the driving and driven shafts are included in the analysis. The coupled equations of motion for the geared shaft system are developed along with a constraint equation which ensures contact between the two mating teeth. The free vibration problem is solved to obtain the natural frequencies and mode shapes. Normal mode analysis is employed to obtain the dynamic response of the system to excitations arising from the mass unbalance and geometrical eccentricity in the gears. The effect of unbalance and geometrical eccentricity on the dynamic tooth load are studied. Author

N85-18416# Ford Motor Co., Dearborn, Mich. Manufacturing Processes Lab.

PRECISION MEASUREMENT OF TORSIONAL OSCILLATIONS INDUCED BY GEAR ERRORS

S. L. Shmuter *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 77-88 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

An original and practical measuring technique applicable to torsional and gear related systems is described. The technique incorporates a novel angular sensor with resolution of better than 1 part in 10,000 in velocity variations, which is based on commercially available components. A method of establishing dynamic response of a drive train is presented. The method depends on the internal excitation from a gear set itself, thus eliminating any external devices. The resulting response closely describes dynamic behavior of a real rotating system. An efficient and accurate algorithm to perform Fourier order analysis of the conjugate error is devised for the general case of hunting tooth geometry of the gear set. R.J.F.

N85-18417# Dayton Univ., Ohio. Research Inst.

THE ANALYSIS BY THE LUMPED PARAMETER METHOD OF SLADE PLATFORM FRICTION DAMPERS USED IN THE HIGH PRESSURE FUEL TURBOPUMP ON THE SPACE SHUTTLE MAIN ENGINE

R. J. Dominic *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 89-98 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Premature cracking of the first stage turbine blades in the high pressure fuel turbopump of the space shuttle main engine could be alleviated by redesign of the platform friction dampers that are used to reduce the vibration response of the blades. Friction damper effectiveness was analyzed using the lumped parameter method. Procedures are described. Results show that the effectiveness of the blade platform dampers can be increased if the operating parameters of the system can be defined. A.R.H.

N85-18418*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

TRANSIENT VIBRATION TEST CRITERIA FOR SPACECRAFT HARDWARE

D. L. Kern and C. D. Hayes *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 99-110 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20K

Transient vibration test criteria, developed for spacecraft hardware, provide a test rationale to verify the capability of the hardware to withstand the low and mid frequency transient vibration environments induced by launch vehicle events. A test method, consisting of a series of discrete frequency, limited cycle, modulated sine wave pulses, was developed to avoid the slow swept sine drawbacks, yet provide a repeatable test that would excite all frequencies. The shape of the waveform is that of the classic response of the mass of a one degree of freedom system when it is base-excited by an exponentially decayed sine wave transient. Criteria were developed to define pulse amplitudes, shapes, and center frequencies from spacecraft loads analyses. Test tolerance criteria were also developed and specified. The transient vibration test criteria were implemented on spacecraft flight hardware and provided a more realistic test simulation (i.e., less conservative) for qualification of spacecraft hardware without risk of undertest. A.R.H.

N85-18419# Forest Products Lab., Madison, Wis.

VIBRATIONAL LOADING MECHANISM OF UNITIZED CORRUGATED CONTAINERS WITH CUSHIONS AND NON-LOAD-BEARING CONTENTS

Thomas J. Urbanik *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 111-122 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Unitized fiberboard containers need strength beyond the warehouse stacking requirements to support dynamic loads during shipping. The spring rates of top-loaded containers and internal cushions amplify the weight force of a unitized load during transportation. The progressive deformation with top-loading of corrugated containers causes increasingly higher spring rates with a subsequent effect on dynamic loads. Cushions or internal packing provide a natural ability to absorb vibrations to a degree, depending on their spring rates relative to those of the containers. Over-the-road shipping vibrations encompass the natural frequencies of most unitized loads and dynamically load the bottom containers. A worst case assessment calculates the maximum load on the bottom tier, expected during truck transportation. The cushion-to-container spring ratio and the rate of increasing container spring rates with top-loading are the primary variables determining dynamic loads. A.R.H.

N85-18420# Argonne National Lab., Ill. Components Technology Div.

LEAKAGE-FLOW INDUCED VIBRATIONS OF A CHIMNEY STRUCTURE SUSPENDED IN A LIQUID FLOW

H. Chung *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 123-134 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Results are presented of flow-induced vibration tests conducted to assess the vibration characteristics of a chimney structure suspended in a liquid flow. The test article is a full-scale model of a flow chimney used in a nuclear reactor as a part of reactor upper internals. All pertinent prototype conditions achievable were simulated in a laboratory environment. The test results show that the chimney experiences an unstable, motion-limited vibration which has a distinct lock-in phenomenon with respect to the flowrate. This unstable vibration is associated with the leakage-flow-modulated excitation through the small clearances between the chimney and its supports. Author

N85-18421# Lord Corp., Erie, Pa.

THE EXPERIMENTAL PERFORMANCE OF AN OFF-ROAD VEHICLE UTILIZING A SEMI-ACTIVE SUSPENSION

E. J. Krasnicki *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 135-142 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The transition of the semi-active suspension system from an operating laboratory prototype into an operational off-road vehicle protoytpe, which utilizes a self contained semi-active suspension system, is presented. The modified vehicle and a stock vehicle, with a conventional passive suspension system, are compared on a designated test course. The experimental performance results of the On-Off semi-active system and the conventional system are compared and discussed. The improved performance of the semi-active system, predicted by analytical models, is experimentally verified. Author

N85-18422# National Research Inst., Bankura (India).

EFFECT OF AIR CAVITY ON THE VIBRATION ANALYSIS OF LOADED DRUMS

Sasadhar De *In* Shock and Vibration Information Center The Shock and Vibration Bull. 54, Pt. 3 Jun. 1984 p 143-154 refs (For primary document see N85-18406 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The free vibration analysis of loaded circular and annular drums with an enclosed air cavity is considered. The effect of the compressibility of the entrapped air on the vibration characteristics is studied. The membrane over the drum is assumed to be composed of any number of parts with different materials with small loads applied at the junctions. The modification of the frequency spectrum due to such loading is mathematically analyzed and some particular cases are discussed. It is shown that both drums essentially ollow the same rules in the study of the altered frequencies by the application of small loads at the junctions of the membranes. The possibility of construction of an annular drum-head like kettledrum is suggested. Author

N85-18423# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.

COMPRESSIVE STRENGTH-MATURITY RELATIONSHIPS OF MORTAR CONTAINING FLY ASH Final Report

S. A. Ragan Oct. 1984 42 p

(AD-A148705; WES/MP/SL-84-13) Avail: NTIS HC A03/MF A01 CSCL 11/2

The relationships between the compressive strength and maturity of four mortar mixtures containing fly ash were evaluated. The majority of the mortar was determined using both the traditional maturity method proposed by Saul and the maturity-age procedure proposed by Freisleben-Hansen and Pedersen. Two mortar mixtures had a twenty five percent of the cement by absolute volume replaced with Class F fly ash, and two mixtures had 35 percent by the cement of absolute volume replaced with Class F fly ash. Twenty-four compressive strength specimens and three temperature monitoring specimens were fabricated from each batch and cured at the temperature of interest. The curing temperatures investigated included 40 to 80 F. The temperature-age history of the specimens was monitored continuously and compressive strength tests were conducted at various ages up to 28 days. Both the classical maturity method proposed by Saul and the maturity-age procedure proposed by Freisleben-Hansen and Pedersen estimated the compressive strength of the test specimens with a degree of success. The maturity-age procedure resulted in less scatter about the regression lines than the classical method for mortar cured at 85 F and 40-80 F. Less scatter of the classical maturity data was noted for mortar cured at 40 F. GRA

N85-18424# Oak Ridge National Lab., Tenn.

EFFECT OF TEMPERATURE ON THE STRESS-RELAXATION RESPONSE OF A PRESSURE VESSEL STEEL

G. M. Goodwin and R. K. Nanstad Oct. 1984 19 p refs Sponsored by DOE

(TI85-003588; NUREG/CR-3726; ORNL/TM-9149) Avail: NTIS HC A02/MF A01

Extensive cracking in steam generator shells led to questions as to A literature review revealed an absence of stress-relaxation data for the steels of interest, SA-302, grade B, and SA-533,

grade B. The stress-relaxation response at various PWHT temperatures was characterized and the correlation with other measurable properties, such as hardness was determined. A technique utilizing a closed-loop thermal-mechanical simulator, the Gleeble 1500, was developed and used. After producing a microstructure typical of a portion of the heat-affected zone of a weldment, stress relaxation was tested at eight temperatures. Substantial stress relaxation was noted at 593 C and above. Post-test hardness correlated very well with relaxation data. R.S.F.

N85-18425# Oak Ridge National Lab., Tenn.
FRACTURE TOUGHNESS OF AUSTENITIC STAINLESS STEEL WELD METAL AT 4 K
G. M. Goodwin Aug. 1984 27 p refs
(Contract DE-AC05-84OR-21400)
(DE84-016638; ORNL/TM-9172) Avail: NTIS HC A03/MF A01

Selection of the welding processes and weld filler metals for fabrication of a large toroidal superconducting magnet is described. Data available in the literature are collected and compared with data generated in this study for three welding processes, shielded metal arc (SMA), gas tungsten arc (GTA), and flux cored arc (FCA). The GTA welds had the highest fracture toughness as measured by K(sub Ic) estimated from J(sub Ic). It is found that the SMA and FCA welds had about the same toughness, below the GTA values but above the average from the literature. The fracture mode for all three processes was typified by ductile dimples. The fracture morphology of the FCA weld specimens was influenced by the solidification substructure, and small particles were found to be nucleation sites for void formation, especially for the GTA welds. All three welding processes were deemed adequate for the intended service and were used to fabricate the large magnet. A trunnion type turning fixture eliminated the need for welding in the vertical and overhead positions. The GTA process was used for all root passes, and the horizontal welds were filled by the SMA process. DOE

N85-18426# Sandia Labs., Albuquerque, N. Mex.
MODELING STOCHASTIC WIND LOADS ON VERTICAL AXIS WIND TURBINES
P. S. Veers Sep. 1984 18 p refs
(Contract DE-AC04-76DP-00789)
(DE85-001148; SAND-83-1909) Avail: NTIS HC A02/MF A01

The Vertical Axis Wind Turbine (VAWT) is a machine which extracts energy from the wind. Since random turbulence is always present, the ffect of this turbulence on the wind turbine fatigue life must be evaluated. This problem is approached by numerically simulating the turbulence and calculating, in the time domain, the aerodynamic loads on the turbine blades. These loads are reduced to the form of power and cross spectral densities which can be used in standard linear structural analysis codes. The relative importance of the turbulence on blade loads is determined. DOE

N85-18427# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
ASSESSING EXPIRED FATIGUE LIFE IN LARGE TURBINE SHAFTS
F. A. McClintock, H. Nayeb-Hashemi, R. O. Ritchie, E. Wu, and W. T. Wood Jul. 1984 143 p refs
(Contracts DE-AC05-84OR-21400; EX-76-A-01-2295)
(DE84-016676; ORNL/SUB-83-9062/1) Avail: NTIS HC A07/MF A01

Rotating equipment are often subjected to transient high amplitude torsional oscillations thay may severely limit the useful life of the structure through subcritical crack growth of undetected flaws. High strain amplitudes can arise following electrical transients from particular line switching events in electric power generation and transmission systems. At such high torques, fatigue growth occurs in antiplane shear along transverse and/or longitudinal shear planes. An fatigue crack growth under both small-scale yielding and elastic-plastic conditions in a low-strength, low-alloy steel is presented. Continuum fracture mechanics and preliminary mechanistic modeling are combined to serve as a framework for the development of defect tolerant life estimation procedures for components loaded to high torques. DOE

N85-18428# European Space Agency, Paris (France).
THE PRINCIPLE OF VIRTUAL WORK AND ASSOCIATED VARIATIONAL PRINCIPLES
Roger Valid Oct. 1984 64 p refs Transl. into ENGLISH of "Le Principe des Travaux Virtuels et les Principes Variationnels Associes" Rept. ONERA-P-1982-1 ONERA, Paris, 1982 Original language document announced as N84-26361
(ESA-TT-873; ONERA-P-1982-1) Avail: NTIS HC A04/MF A01

Results provided by the principle of virtual work in continuum mechanics, and in particular by the primal principle are reviewed. Mixed, hybrid, and complementary energy principles in the linear and nonlinear three-dimensional case are presented. Principles relating to Kirchhoff-Love shells are studied in the nonlinear case. Important considerations for numerical applications are mentioned. The classical criterion of static stability is extended to the whole family of these principles. Author (ESA)

N85-18429# British Gas Corp., Newcastle-upon-Tyne (England). Enginnering Research Station.
HYDROGEN INDUCED CRACKING IN PIPELINE STEELS
A. Brown and C. L. Jones Feb. 1983 24 p refs Presented at Corrosion/83, Anaheim, CA., 18-22 Apr. 1983
(ERS-E.327) Avail: NTIS HC A02/MF A01

Hydrogen induced cracking (HIC) resistance of gas pipeline steels was assessed in laboratory tests on pipelines and fittings steels. The metallurgical parameters controlling HIC resistance were established. The effects of nonmetallic inclusions, sulfur content, alloy segregation and microstructure are described. It is suggested that pipeline steels for sour gas/oil service should have a sulfur content $< 0.005\%$ and effective inclusion shape control by calcium or REM treatment. Reduction of the manganese content to the minimum possible level and the use of quenched and tempered steels are also beneficial. Small additions of copper, nickel and/or chromium may offer protection under certain operating conditions. Author (ESA)

N85-18430# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
MECHANISM OF HYDROGEN INDUCED CRACKING IN PIPELINE STEELS
C. L. Jones, P. Rodgerson, and A. Brown Oct. 1983 26 p refs Presented at Intern. Conf. on Technol. and Appl. of High Strength Low Alloy steels (HSLA), Philadelphia, 3-6 Oct. 1983
(ERS-E.349) Avail: NTIS HC A03/MF A01

The metallurgical parameters controlling hydrogen induced cracking (HIC) in pipeline steels were investigated. Twenty-nine commercial linepipe and fittings steels were studied using small scale immersion tests in NACE solution and optical and scanning electron microscopy. The roles of nonmetallic inclusions, manganese segregation and microstructure are described and a method of predicting HIC susceptibility is developed. It is concluded that pipeline steels for sour gas/oil service should have a low sulfur content ($< 0.002\%$ for heavily sour conditions), effective nonmetallic inclusion shape control by REM or calcium treatement and low levels of manganese segregation (via the use of improved steel-making practices and a reduction in the bulk manganese content to the minimum possible level). Author (ESA)

N85-18431# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
THE INFLUENCE OF MECHANICAL DAMAGE ON TRANSMISSION PIPELINE INTEGRITY
D. G. Jones and P. Hopkins Feb. 1983 14 p refs Presented at IGU 1983 Intern. Gas Res. Conf., London, 13-16 Jun. 1983
(ERS-E.351) Avail: NTIS HC A02/MF A01

Dent and gouge, and plain dent studies of gas pipelines are reviewed. A failure relationship which allows the tolerance of any combination of denting and gouging to be assessed was defined. Plain dents of depth up to 24% of the pipe diameter have no effect on pipeline integrity. Dents with associated defects are

subject to time dependent behavior in that failure can occur with sustained pressures of 85% of the straight-off failure pressure.
Author (ESA)

N85-18432# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
RESULTS OF AN EPRG ROUND ROBIN TEST PROGRAMME WITH DWTT SPECIMENS
G. D. Fearnehough and A. Cairns Aug. 1983 13 p Presented at 5th AGA/EPRG Line Pipe Res. Sem., San Francisco, Sep. 1983
(ERS-E.365) Avail: NTIS HC A02/MF A01

Variability within and between laboratories testing three types of drop weight specimen using three materials of different toughness levels typical of gas pipes was assessed. Some laboratories produced toughness results for similar specimen types giving systematically lower or higher energy values than others. Repeatable results are obtained within each laboratory for API and machined notch specimens. Precrack specimens give much more variability even though all the specimens were prepared by one laboratory. Toughness determinations on the highest toughness steel do not exhibit greater varaibility between or within laboratories than the other materials. Author (ESA)

N85-18433# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
RECENT STUDIES OF THE SIGNIFICANCE OF MECHANICAL DAMAGE IN PIPELINES
P. Hopkins, D. Jones, and A. Clyne Aug. 1983 18 p refs Presented at 5th Amer. Gas Assoc. and European Pipeline Res. Group Res. Seminar, San Francisco, Sep. 1983
(ERS-E.367) Avail: NTIS HC A02/MF A01

It is shown that significant cracking below a gouge is associated with denting of gas pipes and all field damage must be inspected for cracking. When assessing the damage the full defect depth must be considered, i.e. gouge and cracking, otherwise assessments might be nonconservative. In certain circumstances shallow cracking may be repaired by grinding but cracking deeper than 0.7 mm requires major repair. Combined dent and gouge is a particularly severe form of mechanical damage that can cause pipeline failure at low stress levels. This type of damage is sensitive to fatigue cycling and should be treated with caution if detected in pipelines subjected to pressure fluctuations. Author (ESA)

N85-18434# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
STATISTICAL ASPECTS OF SHEAR FRACTURE PROPAGATION
D. G. Jones and G. D. Fearnehough Sep. 1983 17 p refs Presented at 5th Amer. Gas Assoc. and European Pipeline Res. Group Res. Seminar, San Francisco, Sep. 1983
(ERS-E.368) Avail: NTIS HC A02/MF A01

A statistical model for interpretation of the results of brittle fracture propagation tests on pipelines was improved and applied to the analysis of full scale shear fracture propagation test data to derive expressions for the Charpy energy necessary for 50% and 95% confidence of fracture arrest. Mathematical details and a simplified summary of the statistical model are presented.
Author (ESA)

N85-18435# Rolls-Royce Ltd., Derby (England).
STUDY OF RESIDUAL STRESSES INTRODUCED INTO TA6ZrD (685) CYLINDERS BY QUENCHING
S. Denis (Ecole des Mines, Nancy) 14 Nov. 1984 23 p refs Transl. into ENGLISH of French Doc. Rept. Trans-16684/TLT-00921
(PNR-90240; Trans-16684/TLT-00921) Avail: NTIS HC A02/MF A01

A model for predicting the residual stresses introduced into titanium alloy cylinders by quenching was developed. The model shows that the first order stress level is relatively low under practical alloy treatment conditions and that the core tensile stresses are the result of a shrinkage effect due to surface zones under compression and are not more than a few millimeters thick. Residual stresses are due to plastic deformation caused by quenching from the commencement of cooling when the alloy is still in the beta phase in the center of the part. it is advisable to prevent the deformation of such stresses by using a quenching technique which gives fairly slow cooling at high temperatures provided that such cooling is compatible with the metallurgy of the alloy. Removal of a relatively thin layer of metal by machining tends to release the residual tensile stresses in the center.
Author (ESA)

42 GEOSCIENCES (GENERAL)

N85-18436# California Univ., Berkeley. Lawrence Berkeley Lab.
EARTH SCIENCES DIVISION REPORT, 1983 Annual Report
Jul. 1984 232 p refs
(Contract DE-AC03-76SF-00098)
(DE85-001036; LBL-16920) Avail: NTIS HC A11/MF A01

Research is reported on reservoir engineering and hydrogeology, geomechanics, geophysics, and geochemistry. Separate entries were prepared for 67 research activities. Radioactive waste disposal, pollution transport, and heat transfer processes are discussed. DOE

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-18437 Texas Univ., Austin.
USING THE GLOBAL POSITIONING SYSTEM (GPS) PHASE OBSERVABLE FOR RELATIVE GEODESY: MODELING, PROCESSING, AND RESULTS Ph.D. Thesis
Benjamin William Remondi 1984 324 p
Avail: Univ. Microfilms Order No. DA8421790

Performing centimeter-level relative positioning geodesy (translocation), using L-band signals from Global Positioning System (GPS) satellites, was research. Specifically, signal phase was the data measurement. A detailed model of the observable was developed; existing methods of processing the data were developed and extended; new methods of processing the phase observable were developed and compared. Algorithmic development, data, processing run streams, and results are included. Dissert. Abstr.

N85-18438 Rensselaer Polytechnic Inst., Troy, N. Y.
AUTOMATIC MAP NAME PLACEMENT SYSTEM Ph.D. Thesis
John Kwangho Ahn 1984 93 p
Avail: Univ. Microfilms Order No. DA8426504

Name placement on maps is a time-consuming process. This thesis describes a computer system that automatically places names of map features. This is done by identifying and applying the rules used by cartographers in placing names on a map. Some examples of these rules are spanning the area to show the extent and orientation of an area feature, following the curvature of a line feature, not having names overlap point features or other names, and those rules designed to achieve an aesthetically pleasing appearance. These rules are applied with the aid of precedence rules that determine the order of name placement. The precedence rules are designed to increase the effectiveness of free-space search and minimize the movement of names. In addition to precedence rules, a shape analysis algorithm using skeletons (also known as medial axis transformation) aids in spanning an area feature. A curvature analysis algorithm enables line feature names to follow the curvature of the line features. A state-space search algorithm that uses a heuristic function is needed to avoid overlaps among point feature names.
Dissert. Abstr.

N85-18439 Wisconsin Univ., Madison.
SYMBOL STRUCTURE, INFORMATION CONTENT AND VISUAL FORM: A CARTO-SENIOTIC THEORY OF MAP SIGNS Ph.D. Thesis
Hans J. Stolle 1984 272 p
Avail: Univ. Microfilms Order No. DA8419968

Since the proposed carto-semiotic theory was designed around the human mechanism of cognition, it provides a conceptual basis for most theoretical issues of map information processing. Hence, the proposed theory, which utilizes prototypical mental constructs as the basis for mapping perceived structures and meanings, lends itself to dealing with matters of map design as well as map use. Thus, the proposed theory of signs provides the experienced cartographer with a logic for analyzing and refining the intuitive skills of map design. For the novice and occasional mapmaker, the formalized approach furnishes a method for designing maps. For the student, the proposed theory of signs facilitates a better understanding of maps. And, for the researcher, the theory present a subject for testing and further development. Dissert. Abstr.

N85-18440 Bayerische Akademie der Wissenschaften, Munich (West Germany).
[ACTIVITIES REPORT OF THE DEPARTMENT OF APPLIED RESEARCH 78 FOR SATELLITE GEODESY OF THE TECHNICAL UNIVERSITY, MUNICH] Annual Report, 1983 [DIE ARBEITEN DES SONDERFORSCHUNGSBEREICHES 78 SATELLITENGEODAESIE DER TECHNISCHE UNIVERSITAET MUENCHEN]
Manfred Schneider 1984 272 p refs In GERMAN
(Astron-Geodaet-Arb-45; ISBN-3-7696-9788-x; ISSN-0340-7691) Copyright. Avail: Issuing Activity

Geodesy, laser landmarking, radiointerferometry, and microwave metrology research is summarized. Topics discussed include: range finding, mobile laser range determination, construction of a reception station for radiointerfermetry, microwave measurements, geopotential, Earth-Moon interaction, kinefic geogedic coordinates, and geophysical application of interferometric methods. Author (ESA)

N85-18441 Bayerische Akademie der Wissenschaften, Munich (West Germany).
CONTINENTAL NETWORKS: REPORT ON THE ACTIVITIES OF THE INTERNATIONAL ASSOCIATION OF GEODESY (IAG) COMMISSION 10, 1979 - 1983
Rudolf Sigl 1984 49 p refs Presented at Intern. Assoc. of Geodesy on the Occassion of the 18th IUGG Gen. Assembly, Hamburg, 15-27 Aug. 1983
(Ser-B-266; ISBN-3-7696-8559-8; ISSN-0065-5317) Copyright. Avail: Issuing Activity

Progress in establishing continental scale vertical and horizontal geodesy networks is summarized. Work in North America, South America, Southeast Asia and the Pacific, and India is described. Author (ESA)

N85-18442*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBSERVATION OF A WESTWARD TRAVELLING SURGE FROM SATELLITES AT LOW, MEDIUM AND HIGH ALTITUDES
Eigil Ungstrup (Danish Space Research Inst., Lyngby), R. D. Sharp (Lockheed Palo Alto Research Lab.), C. A. Cattell (California Univ., Berkeley), R. R. Anderson (Iowa Univ., Iowa City), R. J. Fitzenreiter, D. S. Evans (NOAA, Boulder, Colo.), and D. N. Baker (LASL, N. Mex.) Lyngby, Denmark Danish Space Research Inst. 1984 69 p refs
(NASA-TM-87434; NAS 1.15:87434; DRI-2-84) Avail: NTIS HC A04/MF A01 CSCL 02C

The motion of discontinuity; electric potential and current structure of the event; energy source and flow; wave-particle interactions; and particle acceleration are addressed using wave, electron, ion mass spectrometer, dc electric field, and magnetic field observation from the Isee-1, NOAA-6, and the 1976-059 geostationary satellite. B.G.

N85-18443*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DATA REPORT ON VARIATIONS IN THE COMPOSITION OF SEA ICE DURING MIZEX/EAST'83 WITH THE NIMBUS-7 SMMR
Per Gloersen Dec. 1984 144 p
(NASA-TM-86170; NAS 1.15:86170) Avail: NTIS HC A07/MF A01 CSCL 08L

Data acquired with the scanning multichannel microwave radiometer (SMMR) on board the Nimbus-7 satellite for a six-week period including the 1983 MIZEX in Fram Strait were analyzed with the use of a previously developed procedure for calculating sea ice concentration, multiyear fraction, and ice temperature. These calculations can compared with independent observations made on the surface and from aircraft in order to check the validity of the calculations based on SMMR data. The calculation of multiyear fraction, which was known earlier to be invalid near the melting point of sea ice, was of particular interest during this period. The indication of multiyear ice was found to disappear a number of times, presumably corresponding to freeze/thaw cycles which occurred in this time period. Both grid-print maps and grey-scale images of total sea ice concentration and multiyear sea ice fraction for the entire period are included. Author

N85-18444*# Ohio State Univ., Columbus. Dept. of Botany.
COMPARATIVE EFFECTS OF AUXIN AND ABSCISIC ACID ON GROWTH, HYDROGEN ION EFFLUX AND GRAVITROPISM IN PRIMARY ROOTS OF MAIZE
Michael L. Evans and Timothy J. Mulkey 1984 11 p refs Submitted for publication
(Grant NAGw-297)
(NASA-CR-174355; NAS 1.174355) Avail: NTIS HC A02/MF A01 CSCL 02C

In order to test the idea that auxin action on root growth may be mediated by H(+) movement, the correlation of auxin action on growth and H(+) movement in roots was examined along with changes in H(+) efflux patterns associated with the asymmetric growth which occurs during gravitropism. The effects of indoleacetic acid (IAA) and abscisic acid (AbA) on growth, H(+) secretion, and gravitropism in roots were compared. Results show a close correlation existent between H(+) efflux and growth in maize roots. In intact roots there is strong H(+) efflux from the elongation zone. Growth-promoting concentrations of IAA stimulate H(+) efflux. During gravitropism the H(+) efflux from the elongation zone becomes asymmetric; the evidence indicates that auxin redistribution contributes to the development of acid efflux asymmetry. That AbA stimulates root growth is reflected in its ability to stimulate H(+) efflux from apical root segments. R.S.F.

N85-18445*# Defense Mapping Agency, Washington, D.C.
WORLD GEODETIC SYSTEM, 1984
M. M. Macomber 1984 11 p refs
(AD-A147409) Avail: NTIS HC A02/MF A01 CSCL 08/5

DoD has developed a new World Geodetic System 1984 (WGS 84) which includes an ellipsoidal model, a gravity formula, an Earth gravitational model and transformation equations from conventional geodetic datums to WGS 84. Implementation of this System will be in 1985. GRA

N85-18446# Utah Geological and Mineralogical Survey, Salt Lake City. Energy Section.
GEOTHERMAL ASSESSMENT OF PART OF THE EAST SHORE AREA, DAVIS AND WEBER COUNTIES, UTAH
R. H. Klauk and C. A. Prawl Jul. 1984 95 p refs
(Contract DE-AS07-77ET-28393)
(DE84-016817; DOE/ET-28393/T3) Avail: NTIS HC A05/MF A01

Geothermal reconnaissance techniques attempted included a water temperature survey, and chemical analyses of springs and wells. The temperature survey identified 12 wells with water temperatures 20 (0)C or higher. These wells were, however, located throughout the study area and with the exception of one location (W-15), exhibited no other low temperature thermal characteristics

that indicated warmer temperatures could be expected at depth or within the vicinity. Sample location W-15 was similar, chemically, to Hooper and Ogden Hot Springs as well as samples collected from three other nonthermal wells in the area. Although these three samples had temperatures that only ranged from 14 to 16 C, chemical geothermometer results indicate temperatures to be expected at depth range from 60 to 90 C. Other chemical characteristics of these samples indicative of low temperature geothermal potential not previously identified include common ion concentrations high in Na and Cl, high concentrations of trace elements such as Li, Ba, and Sr, as well as Ca/HCO3 and Cl/B ratios greater than background. DOE

N85-18447# Sandia Labs., Albuquerque, N. Mex.
TEST PLAN FOR THE FOREST-ECHO EXPERIMENT
D. A. Jelinek Jul. 1984 12 p refs
(Contract DE-AC04-76DP-00789)
(DE84-017175; SAND-83-2195) Avail: NTIS HC A02/MF A01

A test plan to determine the characteristics of the average radar echo from a number of forested terrains is described. The data required to do this will be obtained by using a very narrow pulse width (20 ns) radar and associated hardware on board a helicopter. Data will be taken as the helicopter makes straight and level passes over each terrain at a number of altitudes. Both deciduous and conifer forests will be overflown at different times of the year to determine the effect of seasonal changes. The hardware that will be used and the procedure that will be followed to gather the data are described. The theoretical statistical characteristics of the radar's video output and the amount of intrapulse and interpulse correlation expected are given. DOE

N85-18448# Geological Survey, Lakewood, Colo. Water Resources Div.
GROUND-WATER LEVEL DATA AND PRELIMINARY POTENTIOMETRIC-SURFACE MAPS, YUCCA MOUNTAIN AND VICINITY, NYE COUNTY, NEVADA
J. H. Robison 1984 11 p refs
(Contract DE-AI08-78ET-44802)
(DE85-001771; USGS/WRI-84-4197) Avail: NTIS HC A02/MF A01

Data on ground water levels and preliminary maps of the potentiometric surface beneath Yucca Mountain and adjacent areas, Nye County, Nevada are given. The information was obtained in cooperation with the US Department of Energy to help evaluate the suitability of the area for storing high level nuclear waste. The water level surface shown on the maps generally represents water table (unconfined) conditions. The water table in the Yucca Mountain area occurs in ash flow and air fall tuffs of Tertiary age. West of the crest of Yucca Mountain, water level altitudes are about 775 meters above sea level. Along the eastern edge and southern end of Yucca Mountain, the potentiometric surface generally is nearly flat, is about 728 to 730 meters above sea level, and has a southeastward slope. DOE

N85-18449# Oak Ridge National Lab., Tenn. Energy Div.
FIELD IMPLEMENTATION OF GEOPHYSICAL DIFFRACTION TOMOGRAPHY
Alan J. Witten and Scott S. Stevens 1984 14 p refs Presented at the 6th Ann. Low-Level Waste Management Program Participants' Information Meeting, Denver, 11 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE84-017594; CONF-8409115-1) Avail: NTIS HC A02/MF A01

Geophysical diffraction tomography is a new technique that shows promise as tool for quantitative subsurface imaging. The approach is based upon the filtered backpropagation algorithm, which is a mathematical extension of the reconstruction software used in conventional X-ray CAT scanners. The difference between this method and existing methods is that the new algorithm rigorously accounts for diffraction effects through an exact inversion of the wave equation. This refinement is necessary in that it admits the use of acoustic and long wavelength electromagnetic waves, allowing tomography to be taken from the laboratory to the field. The geophysical diffraction tomography effort involves reducing the filtered backpropagation algorithm to practice. This requires the design and construction of field instrumentation and the development of an improved algorithm. The original algorithm requires the imaged region to be illuminated by plane waves. This requirement simplifies the algorithm but complicates its field implementation in that plane waves are difficult to generate. Generalization of the filtered backpropagation algorithm to allow a broader range of incoming wave fields which can more easily be realized in the field was examined. DOE

N85-18450# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SIMULTANEOUS DETERMINATION OF THE XI AND ETA COMPONENTS OF VERTICAL DEFLECTION WITH A PRISM ASTROLABE [SIMULTANBESTIMMUNGEN DER LOTABWEICHUNGSKOMPONENTEN XI UND ETA MIT DEM PRISMEN-ASTROLABIUM]
Adolf Roedde 1984 22 p refs In GERMAN; ENGLISH summary
(Ser-B-270-Mitt-171; ISSN-0071-9196) Avail: NTIS HC A02/MF A01

Astronomical observation of latitudes and longitudes on the geoid profile at 48 deg latitude were carried out at 5 stations. A table sets out all stations of this profile with their deflection of the vertical components in the system RE 1950. Author (ESA)

N85-17970# Michigan Univ., Ann Arbor.
AUTOMATED AND INTERACTIVE DATA BASE GENERATION
B. Ohmann and B. Fowler *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 109-124 (For primary document see N85-17962 09-01)
(AD-P004316) Avail: NTIS HC A22/MF A01 CSCL 08/2

N85-17971# Evans and Sutherland Computer Corp., Salt Lake City, Utah.
GEOGRAPHIC SUBDIVISION AND TOP LEVEL DATA STRUCTURES, COLUMBUS, MAGELLAN, AND EXPANDING CIG (COMPUTER IMAGE GENERATION) HORIZONS
L. C. Clark and M. R. Pafford *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 129-149 (For primary document see N85-17962 09-01)
(AD-P004317) Avail: NTIS HC A22/MF A01 CSCL 08/2

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-18451*# Georgia Inst. of Tech., Atlanta.
TECHNOLOGY FOR SATELLITE POWER CONVERSION Interim Technical Report
D. P. Campbell, M. A. Gouker, C. Summers, and J. J. Gallagher 5 Oct. 1984 80 p refs
(Grant NAG3-282)
(NASA-CR-174335; NAS 1.26:174335) Avail: NTIS HC A05/MF A01 CSCL 10A

Techniques for satellite electromagnetic energy transfer and power conversion at millimeter and infrared wavelengths are discussed. The design requirements for rectenna receiving elements are reviewed for both coherent radiation sources and Earth thermal infrared emission. Potential power transmitters including gyrotrons, free electron lasers, and CO2 lasers are assessed along with the rectification properties of metal-oxide metal diode power converters. M.G.

N85-18452# Fischer (Harry C.), Sun City, Fla.
COMPARISON OF ENERGY STORAGE SYSTEMS IN THE UNITED STATES CHILLED WATER VERSUS TWO TYPES OF ICE STORAGE SYSTEMS
Harry C. Fischer 1984 12 p refs Presented at the IEA Workshop on Latent Heat Stores, Stuttgart, 5 Mar. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001102; CONF-8403146-2) Avail: NTIS HC A02/MF A01

Current U.S. production non-storage heat pumps are compared to heat pumps using stored hot water and stored chilled water and to heat pumps using ice-on-coils as a means of using latent heat of fusion of water as a heat source. This equipment is also used as a means of stored cooling for air conditioning during hot weather. An ice-making heat pump which harvests ice as sheets of ice 3 to 4 times per hour and stores the ice in a large inexpensive bin is discussed. The advantages of such an ice-making heat pump to heat in cold weather and cool in hot weather is discussed as it relates to electric utility load management in different parts of the United States. DOE

N85-18453# Oak Ridge National Lab., Tenn.
POWER QUALITY AND PROTECTION OF ELECTRIC DISTRIBUTION SYSTEMS WITH SMALL, DISPERSED GENERATION DEVICES
D. T. Rizy and W. T. Jewell (Oklahoma State Univ.) 1984 7 p refs Presented at the 16th Southeastern Symp. on System Theory, Starkville, Miss., 25 Mar. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000990; CONF-8403149-1) Avail: NTIS HC A02/MF A01

There are several operational problems associated with the connection of small power sources, such as wind turbines and photovoltaic (PV) arrays, to an electric distribution system. In one study the harmonic distortion produced by a subdivision of PV arrays connected through line-commutated inverters was simulated. A second simulation study evaluated protection problems associated with the operation of dispersed ac generators. The purpose of these studies was to examine the adequacy of the electric utility industry's traditional practices and hardware for the operation of dispersed power sources. The results of these simulation studies are discussed and recommendations are given for hardware and system operation needed for accommodating this new technology. DOE

N85-18454# Oak Ridge National Lab., Tenn.
THERMAL ENERGY STORAGE Technical Progress Report, Apr. 1983 - Mar. 1984
J. F. Martin, M. Olszewski, and J. J. Tomlinson Oct. 1984 72 p refs
(Contract DE-AC05-84OR-21400)
(DE85-001492; ORNL/TM-9170) Avail: NTIS HC A04/MF A01

Progress in the development of thermal energy storage (TES) technology under the Oak Ridge National Laboratory TES Program for the period April 1983-March 1984 is reported. The program goals and project structure are presented. Each of the areas of research in TES for building heating and cooling and industrial applications is discussed, and the year's progress is presented. A summary of technology transfer to the private sector is included. DOE

N85-18455# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
HEAT CYCLE RESEARCH PROGRAM
O. J. Demuth 1984 6 p refs Presented at the Geothermal Resources Council Ann. Meeting, Reno, Nev., 27 Aug. 1984
(Contract DE-AC07-76ID-01570)
(DE84-017015; EGG-M-09884; CONF-840809-20) Avail: NTIS HC A02/MF A01

The overall objective of the Heat Cycle Research Program, which is being conducted for the Department of Energy, is to develop technology for effecting improved utilization of moderate temperature geothermal resources. Major thrusts of the effort are directed toward: (1) advances in binary cycle technology, (2) development of direct contact heat exchanger technology for use in applications with resources having high corrosion or scaling potential, and (3) special studies including value analyses for estimating economic advantages of plant improvement concepts and studies of other energy conversion cycles. Some background information relative to the program is presented; the progress and program results to date are summarized; the current effort is discussed briefly; and finally some plans for future tasks are outlined. DOE

N85-18456# Vitro Labs., Silver Spring, Md.
ACTUAL VERSUS DESIGN PERFORMANCE OF SOLAR SYSTEMS IN THE NATIONAL SOLAR DATA NETWORK
T. L. Logee and P. W. Kendall Sep. 1984 131 p refs
(Contract DE-AC01-79CS-30027)
(DE85-001190; SOLAR/0802-84/01) Avail: NTIS HC A07/MF A01

Field measured performance were compared to the designer predicted performance. The field measured data were collected by the National Solar Data Network (NSDN) over a period of 6 years. Data from 25 solar systems were selected from a data pool of some 170 solar systems. Several concerns arose which can be partially allayed by study of the NSDN data. These are: what types of failures occurred and why; how good was the design versus actual performance; why was predicted performance not achieved in the field; and which components should be integrated with a system type for good performance. The measured results were also compared to f-chart 5.1 results. This comparison is a type of normalization in that all systems are modeled with the same process. An added benefit of this normalization is a further validation of the f-Chart model on a fairly large scale. The systems are modeled using equipment design parameters, measured loads, and f-Chart weather data from nearby cities. DOE

N85-18457# Pacific Northwest Lab., Richland, Wash.
FIELD TESTING OF AQUIFER THERMAL ENERGY STORAGE
L. D. Kannberg and R. D. Allen Mar. 1984 9 p refs Presented at Intersociety Energy Conversion Engr. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AC06-76RL-01830)
(DE85-000399; PNL-SA-12191; CONF-840804-52) Avail: NTIS HC A02/MF A01

Results of field and laboratory studies of aquifer thermal energy storage (ATES) indicate both the problems and promise of the concept. Geohydrothermal modeling and field testing demonstrated the ability to recover substantial quantities of aquifer stored energy. However, the local hydrologic conditions play an important role in determining the recovery temperature and storage efficiency. Geochemistry is also an important factor, particularly for higher temperature ATES systems. DOE

N85-18458# Idaho Univ., Moscow. Dept. of Chemical Engineering.
OPTIMIZATION OF DESIGN AND CONTROL STRATEGIES FOR GEOTHERMAL SPACE HEATING SYSTEMS Final Report
James A. Batdorf and George M. Simmons Jul. 1984 96 p refs
(Contract DE-AS07-80ID-12167)
(DE85-000496; DOE/ID-12167/T2) Avail: NTIS HC A05/MF A01

The efficient design and operation of geothermal space heating systems requires careful analysis and departure from normal design practices. Since geothermal source temperatures are much lower than either fossil fuel or electrical source temperatures, the temperature of the delivered energy becomes more critical. Since the geothermal water is rejected after heat exchange, it is necessary to extract all of the energy that is practical in one pass; there is no second change for energy recovery. Several heating system configurations are examined and the desired design and control characteristics for operation on geothermal sources is described. Specific design methods are outlined as well as several generalized guidelines that significantly improve the operation of any geothermally heated system. DOE

N85-18459# Varian Associates, Palo Alto, Calif. Solid State Lab.
ADVANCED HIGH-EFFICIENCY CONCENTRATOR CELLS Semiannual Report, 1 Apr. - 30 Sep. 1983
Jul. 1984 52 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013020; SERI/STR-211-2366) Avail: NTIS HC A04/MF A01

Research designed to produce a multijunction monolithic cascade solar cell operating at greater than or equal to 30% conversion efficiency (1000 AM2 suns, 50 C) is described. The program is based upon the metallorganic chemical vapor deposition (MOCVD) technique of III-V crystal growth. Among the advantages of the MOCVD method are accurate and reproducible grading of material compositions, sharp interfaces and thin epilayers, with potential for eventual scale-up in operation. Several approaches were compared to discern which would be the most promising for the demonstration and optimization of a high-efficiency cascade concentrator cell. Current efforts focused on two-junction devices, although these technologies may be extended to three-junction devices if still higher efficiencies are desired. DOE

N85-18460# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
INITIAL RESULTS FOR SUPERCRITICAL CYCLE EXPERIMENTS USING PURE AND MIXED-HYDROCARBON WORKING FLUIDS
C. J. Bliem and G. I. Mines 1984 6 p refs Presented at the Geothermal Resources Council Ann. Meeting, Reno, Nev., 27 Aug. 1984
(Contract DE-AC07-76ID-01570)
(DE84-017008; EGG-M-10184; CONF-840809-18) Avail: NTIS HC A02/MF A01

The Heat Cycle Research Program, which is being conducted for the Department of Energy, has as its objective the development of the technology for effecting improved utilization of moderate temperature geothermal resources. Testing at the Heat Cycle Research Facility (HCRF) located at the DOE Geothermal Test Facility (GTF), East Mesa, California, is presently being conducted to meet this objective. Current testing involves a supercritical vaporization and countercurrent in-tube condensing system. The paper presents a brief description of the test facility and a discussion of the test program. Preliminary results on the performance of the supercritical heaters, countercurrent in-tube condenser, and turbine are given for both pure and mixed hydrocarbon working fluids. DOE

N85-18461# Oak Ridge National Lab., Tenn.
ADVANCED LATENT HEAT STORAGE MEDIA FOR HIGH-TEMPERATURE INDUSTRIAL APPLICATIONS
M. Olszewski 5 Mar. 1984 12 p refs Presented at IEA Workshop on Latent Heat Stores, Stuttgart, F.R. Germany, 5 Mar. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000907; CONF-8403146-4) Avail: NTIS HC A02/MF A01

Several advanced thermal energy storage (TES) media are being developed for high temperature industrial applications. One of the concepts involves a composite medium consisting of a phase-change carbonate salt supported and immobilized within a submicro sized capillary structure of a particulate ceramic matrix or porous sintered ceramic. Immobilization of the molten salt within the ceramic structure permits operation of the composite pellets, bricks, or other shapes in direct contact with compatible fluids. Energy storage occurs in both sensible and latent forms with the composite providing higher energy storage densities than standard sensible heat storage systems. The second concept centers on the development of a self-encapsulating metallic eutectic. This work focuses on metallic eutectics containing silicon. Starting with a silicon-rich mixture, it is feasible to develop a self-encapsulating pellet by cooling the liquid drops at a controlled rate. A solid of nearly pure silicon will form on the exterior of the pellet leaving a eutectic, phase change media in the interior. The concept are described and information concerning current development activities is presented. DOE

N85-18462# Washington State Energy Office, Olympia.
PRELIMINARY SURVEY OF WIND GENERATION IN WASHINGTON: SITE STUDIES AND SELECTED WIND SPEED DATA
Priscilla J. Pierce, Jeffrey W. James, and Nancy Kinnear Sep. 1984 132 p refs Sponsored in part by DOE
(DE85-000058; WAOENG-83-46) Avail: NTIS HC A07/MF A01

Data are provided for 44 wind energy systems in six regions of the state of Washington. The data include the system's location, type of system and manufacturer, data of installation and installer, performance and operational data, dimensions, cost, factors influencing performance, and the users' response. Conclusions are drawn regarding resource evaluation, wind turbine technology, environmental and safety considerations, institutional issues, and social considerations. Additional data are given for three wind speed measurement projects. DOE

N85-18463# Illinois Inst. of Tech., Chicago. Dept. of Chemical Engineering.
THERMAL DESIGN REQUIREMENTS OF A 50-kW ZINC/REDOX FLOW BATTERY FOR SOLAR ELECTRICAL ENERGY STORAGE
J. R. Selman, H. Wu, and Roger P. Hollandsworth (Lockheed Palo Alto Research Lab.) Sep. 1984 24 p refs Presented at the AIChE Ann. Meeting, San Francisco, 25 Nov. 1984
(Contract DE-AC04-76DP-00789)
(De84-017088; SAND-84-7162C; CONF-841121-6) Avail: NTIS HC A02/MF A01

The conceptual engineering design of a large scale zinc/redox battery for solar electrical energy storage involves the management of considerable heat flows. This is due to the large heat of crystallization of sodium ferrocyanide decahydrate produced during discharge as well as the usual reversible and irreversible cell reaction heat effects. A discussion of practical design implications is presented. DOE

N85-18464# Sandia Labs., Albuquerque, N. Mex. Storage Battery Div.
PROSPECTS FOR ADVANCED STORAGE BATTERY TECHNOLOGIES
1984 28 p refs Presented at the Intern. Telecommunications Energy Conf., New Orleans, 11 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE84-015708; SAND-84-0769C; CONF-841103-1) Avail: NTIS HC A03/MF A01

The sodium/sulfur, zinc/bromine, lead-acid, and nickel/hydrogen electrochemical energy storage systems are discussed in some detail. The sodium/sulfur and zinc/bromine systems are currently under intensive development. The nickel/hydrogen system demonstrated long life in aerospace applications and is being investigated for cost reduction potential. The sealed lead-acid system was developed for maintenance-free stationary applications and is considered for other applications. Aslo discussed briefly are the zinc/chlorine, zinc/ferricyanide, iron/chromium redox, and lithium/metal sulfide systems. Applications requirements are discussed. DOE

N85-18465# New Mexico State Univ., Las Cruces. Energy Inst.
MONITORING ENVIRONMENTAL AND RELATED PERFORMANCE PARAMETERS FOR A RANKINE-CYCLE TURBINE ELECTRIC GENERATOR UTILIZING GEOTHERMAL ENERGY AT THE GILA HOT SPRINGS, NEW MEXICO Final Technical Report
Arlene H. Starkey and Larry Icerman Aug. 1984 23 p
(DE84-901772; NMERDI-2-69-2209) Avail: NTIS HC A02/MF A01

The environmental effects associated with the operation of a privately owned Rankine-cycle turbogenerator unit using low temperature geothermal resources in the form of free-flowing hot springs to produce electricity in a remote, rural area were studied. The following conclusions pertain to the operation of the turbogenerator system: (1) the heat exchanger could not provide sufficient freon vapor at the required pressures to provide adequate thermal input to the turbine; (2) conversion or redesign of the condenser

and return pump to function adequately represents a problem of unknown difficulty; (3) all pressure and heat transfer tests indicated that a custom designed heat exchanger built on-site would provide adequate vapor at pressures high enough to power a 10-kW (sub e) or perhaps larger generator; and (4) automated control systems are needed for the hot and cold water supplies and the freon return pump. DOE

N85-18466# Institute of Oceanographic Sciences, Taunton (England).
ASSESSMENT OF WAVE POWER AVAILABLE AT KEY UNITED KINGDOM SITES
J. A. Crabb 1984 115 p refs Sponsored by UK Dept. of Energy's Wave Energy Program
(IOS-186) Avail: NTIS HC A06/MF A01

Wind and wave parameters in the Atlantic and North Sea were measured to assess the suitability of sites for wavepower utilization. Annual average power is estimated at 16.1 to 65.6 kw/m for the sites. Author (ESA)

N85-18467# Kentron International, Inc., Honolulu, Hawaii.
NOAA OTEC CWP (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION OCEAN THERMAL ENERGY CONVERSION COLD WATER PIPE) AT-SEA TEST. VOLUME 3, PART 1: TABULATION OF THE POWER SPECTRA FOR SELECTED CHANNELS
15 Nov. 1983 226 p
(Contract DASG60-82-C-0002)
(PB84-238955; HDRF-83-0621-Vol-3-Pt-1) Avail: NTIS HC A11/MF A01 CSCL 10B

Data collected during the Ocean Thermal Energy Conversion (OTEC) Cold Water Pipe At-Sea Test was analyzed. Data presented included: (1)sensor factors and off sets and the data processing algorithms used to convert the recorded sensor measurements from electrical units to engineering units; (2) plots of the power spectra estimates obtained from a fast Fourier transform (FFT) analysis of selected channels; (3) plots of selected sensor measurements as a function of time; and (4) plots of bending strain along the pipe. The mean, root-mean-square (RMS) maximum, and minimum values at each depth are shown in each plot. Author (GRA)

N85-18468# Kentron International, Inc., Honolulu, Hawaii.
NOAA OTEC CWP (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION OCEAN THERMAL ENERGY CONVERSION COLD WATER PIPE) AT-SEA TEST. VOLUME 3: ADDITIONAL TABULATION OF THE POWER SPECTRA, PART 2
30 Dec. 1983 316 p refs
(Contract DASG60-82-C-0002)
(PB84-238997; HDRF-84-0694-Vol-3-Pt-2;
NOAA-84080211-Vol-3-Pt-2) Avail: NTIS HC A14/MF A01 CSCL 10B

Data collected during the Ocean Thermal Energy Conversion (OTEC) Cold Water Pipe At Sea Test are analyzed. Also included are the following ittems: (1) sensor factors and offsets, and the data processing algorithms used to convert the recorded sensor measurements from electrical to engineering units; (2) plots of the power spectra estimates obtained from a fast fourier transform (FFT) analysis of selected channels; (3) plots of selected sensor measurements as a function of time; and (4) plots of bending strain along the pipe using statistics and values presented. B.G.

N85-18469# National Bureau of Standards, Gaithersburg, Md. Center for Building Technology.
NBS (NATIONAL BUREAU OF STANDARDS) SOLAR COLLECTOR DURABILITY-RELIABILITY TEST PROGRAM Final Report
David Waksman, William C. Thomas (Virginia Polytechnic Inst. and State Univ., Blacksburg), and Elmer R. Streed Sep. 1984 153 p refs Sponsored in part by DOE
(PB85-113603/GAR; NBS/TN-1:1196) Avail: NTIS HC A08/MF A01; Also Avail. from SOD as SN003-003-02611-5 CSCL 10A

Eight different types of flat plate solar collectors were exposed outdoors at four sites located in different climatic regions. Small scale cover and absorber materials coupon specimens consisting of samples taken from a collector of each of the eight types used and a number of additional materials were exposed concurrently with the full size collectors. Periodic measurements were made of collector and materials performance as a function of outdoor exposure time. Indoor laboratory aging tests were conducted concurrently on specimens of the same materials to provide a basis for comparison with the outdoor exposure tests. The results obtained in this test program are presented. Recommendations are made regarding the use and limitations of performance measurements and environmental exposure tests for assessing the durability of solar collectors and absorber and cover materials. GRA

N85-18470# National Bureau of Standards, Gaithersburg, Md. Center for Building Technology.
THERMAL PERFORMANCE TESTING OF PASSIVE SOLAR COMPONENTS IN NBS (NATIONAL BUREAU OF STANDARDS) CALORIMETER
M. E. McCabe, C. E. Hancock, and M. VanMigon Aug. 1984 71 p refs Sponsored in part by DOE
(PB85-119345/GAR; NBSIR-84/2920) Avail: NTIS HC A05/MF A01 CSCL 14B

Studies of the thermal performance of passive solar buildings indicated a need for precise measurement of solar heat gain and thermal heat loss or gain for modular passive/nhybrid solar components in the outdoor environment. A description of the design, calibration, and initial operational results for a new calorimetric test facility designed to perform these measurements is presented. The test facility is located at the National Bureau of Standards in Gaithersburg, MD, and it is anticipated that it will provide a substantial improvement in the measuring techniques for passive and hybrid solar components over the field test cells currently in use. Thermal performance data were taken for four passive solar test articles during the winter of 1982-1983, including two windows and two collector storage walls. Test results are correlated as U-values and Shading Coefficients for the two windows. Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-18471# American Defense Preparedness Association, Arlington, Va.
PROCEEDINGS OF THE ENVIRONMENTAL SYSTEMS SYMPOSIUM (13TH) HELD AT BETHESDA, MD., 20-22 MARCH 1984
22 Mar. 1984 302 p
(AD-A148194) Avail: NTIS HC A14/MF A01 CSCL 13/2

The disposal, treatment, analysis, assessment, control, and management of hazardous wastes are discussed. Energy audits of government facilities, the incineration of explosives contaminated soils, the stabilization of contaminated soils by vitrification, and aquifer cleanup are among the topics discussed. For individual titles, see N85-18472 through N85-18488.

N85-18472# Council on Environmental Quality, Washington, D.C.
THE APPLICATION OF EMISSIONS TRADING TO DoD INSTALLATIONS
R. D. Cunningham and G. L. Brady *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 13-29 (For primary document see N85-18471 09-45)
(AD-P004136) Avail: NTIS HC A14/MF A01 CSCL 13/2

One of the first major environmental regulatory reform efforts under the Reagan Administration is the Emissions Trading Program. The program provides that States may develop, for Federal approval, a system that allows facilities to trade permits to discharge

air pollutants. The Emissions Trading Program allows relaxation of discharge limitations on one location within an activity while requiring a greater degree of abatement at other locations within the facility or within the region. This paper addresses the potential use of Emissions Trading at DoD installations. Section 2.0 provides a discussion of the Clean Air Act. Section 3.0 summarizes the Emissions Trading concept. Section 4.0 provides three case studies of Emissions Trading, viz., Lemoore Naval Air Station, Norfolk Naval Shipyard, and the Tri-Services Emissions Trading Project. We conclude in Section 5.0 that efforts to incorporate Emissions Trading in the DoD installation planning process will be important as the future development of this air quality management system takes place. GRA

N85-18473# Army Chemical School, Fort McClellan, Ala.
COMPATIBLE GOALS: DEFENSE AND ENVIRONMENTAL PROTECTION
E. R. Clark *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 30-36 (For primary document see N85-18471 09-45)
(AD-P004137) Avail: NTIS HC A14/MF A01 CSCL 13/2

Fort McClellan goals are to properly manage resources that are renewable and conserve those that are not. Another goal is to strive to reduce the environmental insult that is so common when man manipulates the natural environment in pursuit of commonly held needs and values. These broad goals have been developed during the maturation stage of our environmental program and have been finely honed into five specific objectives. (1) To provide environmental education to the widest of audiences with the subject matter tailored to the audience; (2) Prevent material from entering the waste stream. Anything entering the waste stream will be recycled if possible; (3) Actively seek a zero-discharge installation and maintain surface water to the same good biological quality as the water entering the installation. (4) Conserve fossil fuel energy to the highest degree possible to reduce the degrading effect of the natural environment. Further, this recognition is vital to a mobile Army whose readiness is intensely fossil field dependent. (5) Preserve the historical character and the cultural resources on Fort McClellan lands. GRA

N85-18474# JRB Associates, McLean, Va.
ENVIRONMENTAL AND ENERGY AUDITS OF AIR FORCE GOVERNMENT OWNED-CONTRACTOR OPERATED INSTALLATIONS
B. J. Burgher, J. D. Margolis, and D. E. Sanders *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 37-43 (For primary document see N85-18471 09-45)
(AD-P004138) Avail: NTIS HC A14/MF A01 CSCL 13/2

Environmental and energy audits conducted for the Air Force Systems Command, Aeronautical Systems Division (ASD) by JRB Associates of McLean, Virginia resulted in substantial environmental benefits and identified opportunities for energy and material conservation and recovery. This effort has allowed ASD to target resources, substantiate funding requests, develop remedial strategies and track progress of environmental and energy management activities. This paper presents a review of the study completed for ASD in October, 1983. Author (GRA)

N85-18475# Hart (Fred C.) Associates, Inc., New York, N.Y.
STRATEGIES FOR PREPARING AND SUBMITTING A PART B APPLICATION FOR A DOD FACILITY
W. K. Tusa *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 44-55 (For primary document see N85-18471 09-45)
(AD-P004139) Avail: NTIS HC A14/MF A01 CSCL 13/2

The United States Environmental Protection Agency (EPA) has issued regulations to ensure the protection of human health and the environment through the appropriate management of hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act of 1976 (RCRA). Those regulations require most facilities that treat, store or dispose of hazardous waste to obtain a RCRA permit. The application for this permit consists of two parts, Part A and Part B. Facilities in existence before November 1980 were required to submit the Part A application by November 19, 1980. These facilities were granted interim status under the regulations, which permits them to continue operations until final administrative action is taken on their permit. This requires the submittal of a detailed Part B permit application. The permit application must contain sufficient information to assure EPA that the facility design, operation and proposed closure and post-closure plans will satisfy the applicable permitting standards. The Part B process is complex, uncertain and inherently subjective. While the level of uncertainties is decreasing, the applicant can minimize the uncertainties by aggressively managing the process. The applicant must plan his strategy, pay particular attention to details and follow through daily if necessary. The long-term cost savings alone should justify the increased attention given to management of the Part B application process. GRA

N85-18476# Naval Ordnance Station, Indian Head, Md.
ASSESSMENT OF ENVIRONMENTAL COSTS AT ORDNANCE ACTIVITIES
L. J. Lay, M. F. Larson, and P. G. Clements *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 56-99 (For primary document see N85-18471 09-45)
(AD-P004140) Avail: NTIS HC A14/MF A01 CSCL 05/1

Environmental protection programs, necessitated by governmental regulations, require manhours and materials to administer. This costs money. The purpose of this study was to determine the magnitude of expenses associated with the programs mandated in the Navy's Environmental and Natural Resources Protection Manual; OPNVINST 5090.1 of 26 May 1983. GRA

N85-18477# Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Md.
REMEDIAL ACTION OF HAZARDOUS WASTE US ARMY CORPS OF ENGINEERS, ANNISTON, ALABAMA
L. G. Copeland and R. J. York *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 100-116 (For primary document see N85-18471 09-45)
(AD-P004141) Avail: NTIS HC A14/MF A01 CSCL 13/2

One of the primary missions of the Anniston Army Depot (ANAD) is the repair of combat vehicles. Industrial processes which are utilized in the accomplishment of this mission led to the production of a large number of waste chemicals, mainly degreasing, paint stripping and metals processing sludges. Many of these waste chemicals are classified as hazardous under both Federal and State of Alabama hazardous waste regulations. The potential for localized groundwater contamination led to the decision to exhume, remove and dispose of the contaminated material in the seven disposal trenches. As part of this contract, the hazardous sludges in the old lagoon sludge pile were to be removed, although groundwater contamination was not associated with this site. Through the use of ground penetrating radar (GPR), magnetometry, metal detection and electromagnetics, the exact boundaries of the chemical sludge disposal trenches were determined. A total of 62,119 tons of contaminated material and soils from the chemical sludge disposal trenches, old lagoon sludge pile and chemical sump at Building 130 were exhumed, transported and disposed of during the project. GRA

N85-18478# Weston (Roy F.), Inc., West Chester, Pa.
INCINERATION OF EXPLOSIVES CONTAMINATED SOILS
J. W. Noland and W. E. Sisk *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 117-130 (For primary document see N85-18471 09-45)
(AD-P004142) Avail: NTIS HC A14/MF A01 CSCL 13/2

The objectives of the Incineration of Explosives Contaminated Soils (IECS) project were as follows: The primary objective of these tests was to demonstrate the effectiveness of incineration as a decontamination method for explosives contaminated soils. The secondary objectives of the project were to: develop a data base and appropriate correlations for designing and predicting the performance of the incinerator as a decontamination method;

determine the fate of the explosives and metals in the contaminated soils during/after incineration; and measure pollutant levels in the stack gas to determine the air pollution control devices that would be required for incinerators that may be used in the future to incinerate explosives contaminated soils. GRA

N85-18479# Engineering-Science, Inc., Fairfax, Va.
POLYMERIC LINER SELECTION FOR MILITARY WASTE IMPOUNDMENTS
J. W. Braswell, G. M. Gibbons, and T. G. Shea *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 131-150 (For primary document see N85-18471 09-45)
(AD-P004143) Avail: NTIS HC A14/MF A01 CSCL 13/2

Until the last decade; lagooning was the accepted method of disposal of wastewaters from the manufacture of munitions. As a result, explosive compounds such as TNT and RDX are found in many of the lagoons that have been used by the Army for this purpose. Because these compounds have been defined as hazardous under RCRA, it may be necessary to remove, transport or dispose of the lagoon sediments or the residuals from the treatment of these sediments from many of the lagoons. It was assumed that synthetic liners would be used in many of these clean-up operations, but synthetic membrane liners may or may not be compatible with the chemical compounds found in these sediments. This work was done to provide initial polymeric liner compatibility data for selected explosives and solvents, in order to determine the applicability of polymeric liners for the cleanup and restoration of impoundments containing wastes from the manufacture of explosives. GRA

N85-18480# Battelle Pacific Northwest Labs., Richland, Wash.
STABILIZATION OF CONTAMINATED SOILS BY IN SITU VITRIFICATION
C. L. Timmerman *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 151-163 (For primary document see N85-18471 09-45)
(Contract DE-AC06-76RL-01830)
(AD-P004144; PNL-SA-11638) Avail: NTIS HC A14/MF A01 CSCL 13/2

In Situ Vitrification is an emerging technology developed by Pacific Northwest Laboratory for potential in-place immobilization of radioactive wastes. The contaminated soil is stabilized and converted to an inert glass form. This conversion is accomplished by inserting electrodes in the soil and establishing an electric current between the electrodes. The electrical energy causes a joule heating effect that melts the soil during processing. Any contaminants released from the melt are collected and routed to an off-gas treatment system. A stable and durable glass block is produced which chemically and physically encapsulates any residual waste components. In situ vitrification has been developed for the potential application to radioactive wastes, specifically, contaminated soil sites; however, it could possibly be applied to hazardous chemical and buried munitions waste sites. Costs for hazardous waste applications are estimated to be less than $175/cu m ($5.00/cu.ft.) of material vitrified. For many applications, in situ vitrification can provide a cost-effective alternative to other disposal options. GRA

N85-18481# Weston (Roy F.), Inc., West Chester, Pa.
APPLYING AN INNOVATIVE APPROACH TO FIELD INVESTIGATIONS AT A REMEDIAL ACTION SITE
M. F. Coia and M. H. Corbin *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 164-173 (For primary document see N85-18471 09-45)
(AD-P004145) Avail: NTIS HC A14/MF A01 CSCL 13/2

This paper describes an approach that can be applied to a hazardous waste site where known groundwater contamination exists and where remedial action is necessary to mitigate the environmental concerns. The sampling program is conducted to locate, as accurately as possible, the position, extent and depth of contaminant source areas, and to identify the potential contaminants present as well as the potential extent of contaminant migration in the soil and groundwater. These sampling procedures utilize the maximum number of backhoe trench excavations (to locate the apparent boundary of contaminant source areas and obtain composite soil samples along a prescribed coordinate grid system) and field-implemented analytical techniques (to screen soil samples and eliminate those of little or no contamination). Laboratory analytical procedures are used to characterize the waste constituents found in the source areas and contaminated soils, and to provide the necessary level of quality assurance. In all, the sampling program described herein maximizes the use of field-implemented analytical techniques which reduces the overall cost of laboratory analytical procedures. GRA

N85-18482# Army Armament Research and Development Command, Dover, N. J.
TREATMENT OF WASTEWATER (RED WATER) RESULTING FROM TNT (TRINITROTOLUENE) PURIFICATION
J. Carrazza, E. Pregun, C. Chandler, and W. Helbert *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 179-197 (For primary document see N85-18471 09-45)
(AD-P004146) Avail: NTIS HC A14/MF A01 CSCL 13/2

Numerous approaches have been investigated to either concentrate the red water for disposal or recover reusable products. These approaches included reverse osmosis, acidification, Tampella Process, Atomics International Aqueous Carbonate Process, SCA Billerud Process, and the Sonoco Sulfite Recovery Process (SSRP). An assessment of these techniques based upon level of TNT production, foreign patent and scale down problems, simplicity of design, capital and operating cost estimates and other criteria resulted in selection of the SSRP for further evaluation. Extensive laboratory and pilot plant studies of process feedstock formulations, pellet versus slurry feed, multi-hearth versus rotary kiln furnace, evaporators, separators, dryers, feedstock mixers and transport systems were conducted. This resulted in the development of criteria currently being utilized for implementation of a sulfite recovery facility to support TNT production at Radford Army Ammunition Plant (RAAP). The SRP process is developed for RAAP is described. GRA

N85-18483# Battelle Pacific Northwest Labs., Richland, Wash.
LOCATION OF VOLATILE BURIED WASTES BY FIELD PORTABLE INSTRUMENTATION
G. L. McKown *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 198-204 (For primary document see N85-18471 09-45)
(AD-P004147) Avail: NTIS HC A14/MF A01 CSCL 13/2

Contamination of environmental media by volatile organic chemicals has been observed at a wide variety of industrial and government facilities. In particular, volatile halogenated hydrocarbons (VHH) have been shown to pose problems of such magnitude that special regulatory standards are being considered for these materials. Difficulties are encountered when characterizing a site that involves VHH contamination. Some of the factors which increase the difficulties are discussed: There are no standard methods for sampling and analysis for volatile constituents in soil matrices. There is good evidence that several of the species may be transformed biologically. There is evidence to suggest that the volatile halogenated species may undergo nonlinear absorption in soil matrices. These factors limit the ability to determine source location and strength in the case of buried, non-containerized wastes. Adequate sampling of the subsurface waste deposits is both time-consuming and of questionable validity, and the degradation/retardation complications reduce the appropriateness of plume-tracking as a means for determining source characteristics. This paper describes an approach to the sampling and analysis problem which was employed in a recent site characterization effort. GRA

N85-18484# Engineering-Science, Inc., Fairfax, Va.
PRACTICAL APPLICATION OF EARTH RESISTIVITY METHODS IN PHASE 2 OF THE INSTALLATION RESTORATION PROGRAM

H. D. Harman, Jr. and J. N. Baker *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 205-224 (For primary document see N85-18471 09-45)
(AD-P004148) Avail: NTIS HC A14/MF A01 CSCL 13/2

The Department of Defense (DOD) Installation Restoration Program (IRP) establishes DOD policy to identify and evaluate suspected problems associated with past hazardous waste contamination. Phase 1 of the IRP is the initial assessment and records search of sites that potentially contain hazardous waste. Phase 2 is the confirmation and quantification of potentially hazardous waste sites. Phase 3, the technology base development, and Phase 4, the remedial actions, will follow the identification of hazardous waste sites. Within Phase 2 of the IRP, the most important objectives are to determine if suspected contamination of a site exists, and if it does, then adequately describe the site geologic conditions and define the extent of subsurface as well as surface contamination. This paper discusses the potential utilization of electrical resistivity surveys during Phase 2 of the IRP. The successful utilization of ER is based on a combination of both technical approach and knowledge and skill of the user. As examples of ER utilization, two case studies involving ER surveys are described. GRA

N85-18485# Defense Logistics Agency, Alexandria, Va.
THE HAZARDOUS MATERIALS TECHNICAL CENTER
D. A. Appler, M. J. Brown, and T. Rothman *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 225-234 (For primary document see N85-18471 09-45)
(AD-P004149) Avail: NTIS HC A14/MF A01 CSCL 05/2

The Hazardous Materials Technical Center (HMTC) was established in June 1982 by the Defense Logistics Agency (DLA) to provide a center of expertise on technology and regulations related to handling, storage, transportation and disposal of hazardous materials. This presentation discusses the purpose, functions, and operating experience of the HMTC. The HMTC is an Information Analysis Center operated for DLA with technical supervision by the U.S. Army Environmental Hygiene Agency and DLA. The purpose of the HMTC is to provide a single location as a source for information on all aspects of hazardous materials technology and regulatory requirements. To develop this source HMTC will Identify, Collect, Assess, Synthesize, and Disseminate information on technology and regulations for the management of hazardous materials and wastes. This information will cover all aspects of hazardous materials/waste management and will come from a wide variety of sources. The data will be evaluated by the HMTC staff and the result disseminated in user friendly manner by the most appropriate means. GRA

N85-18486# Environmental Protection Agency, Washington, D.C.
COMMUNITY RELATIONS ACTIVITIES AT DEPARTMENT OF DEFENSE SITES
D. Gemmill and M. D. Sexton *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 235-244 (For primary document see N85-18471 09-45)
(AD-P004150) Avail: NTIS HC A14/MF A01 CSCL 13/2

Community relations activities during hazardous waste site cleanups are important for several reasons. Through these activities, the response agency can provide citizens affected by the site with needed information about site contamination and the likely effects of cleanup actions. Citizens in turn can provide the response agency with needed information about the extent of contamination, about alternative response actions, and about responsible parties. And, a close working relationship between the response agency and the community can help ensure that the community will support a cost-effective remedy at the site. This paper describes what the Environmental Protection Agency (EPA) has learned about effective community relations activities at hazardous waste sites and suggests how some aspects of EPA's approach to community relations may be applicable to Department of Defense (DOD) sites. GRA

N85-18487# Oklahoma Univ., Norman.
PROTOCOL FOR AQUIFER CLEANUP DECISION MAKING AT MILITARY INSTALLATIONS
R. C. Knox and L. W. Canter *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 284-296 (For primary document see N85-18471 09-45)
(AD-P004151) Avail: NTIS HC A14/MF A01 CSCL 13/2

Hazardous wastes are of concern since they may be lethal, nondegradable, persistent in nature, and/or biologically magnified. Planned and unplanned discharges of hazardous wastes can lead to soil contamination and, possibly, surface and ground water contamination as a result of surface runoff and subsurface transport. Soil contamination has occurred in the vicinity of planned landfills and liquid waste holding ponds which are located in permeable soils or improperly lined. Unplanned discharges can occur as a result of accidental spills, and soils in spill areas have also been contaminated. The final step in the protocol involves weighing the economic, environmental and risk assessments appropriately and deriving an optimum solution. A large number and wide variety of decision-making tools are available for selecting an optimum strategy from a list of alternatives. GRA

N85-18488# Battelle Pacific Northwest Labs., Richland, Wash.
ANALYSIS OF GEOHYDROLOGIC DATA BY KRIGING
R. Schalla and J. L. Devary *In* American Defense Preparedness Association Proc. of the Environ. Systems Symp. (13th) 22 Mar. 1984 p 284-296 (For primary document see N85-18471 09-45)
(AD-P004152) Avail: NTIS HC A14/MF A01 CSCL 13/2

Hydrologic characterization of hazardous waste sites is an expensive and challenging task. Making efficient use of field data in modeling subsurface flow and transport can help private firms and government agencies control costs by achieving better results. Often, conventional approaches to geohydrologic data processing (e.g., hand contoured maps) are too subjective to provide the most efficient and accurate use of the data. The geostatistical interpolation technique, kriging, and an elementary streamtube hydraulic conductivity inverse algorithm have been successfully applied to characterize the flow system at a complex hazardous waste site. Kriging aided in identifying the need for additional field measurements, selecting optimal well locations, determining the effect of subjective inferences (by geohydrologists) on the groundwater flow system, establishing data validity, and producing best-fit contour plots from irregularly spaced field measurements. Subsequent field work and the numerical modeling of flow and chemical transport confirmed the value of the geostatistical efforts. GRA

N85-18489# Los Alamos Scientific Lab., N. Mex.
QUALITY ASSURANCE FOR ENVIRONMENTAL ANALYTICAL CHEMISTRY, 1983
E. S. Gladney, C. E. Burns, D. R. Perrin, R. D. Robinson, and N. A. Raybold Jul. 1984 186 p refs
(Contract W-7405-eng-36)
(DE84-016045; LA-10115-MS) Avail: NTIS HC A09/MF A01

The continuing quality assurance effort by the Environmental Surveillance Group is presented. Changes in methodology and computing resources that have taken place since the previous report in this series are documented. All quality assurance reference materials now in use, their certified or consensus concentrations, and all analytical chemistry quality assurance measurements made by HSE-8 during 1983 are included. DOE

N85-18490# Pacific Northwest Lab., Richland, Wash.
COMPARING COMPUTING FORMULAS FOR ESTIMATING CONCENTRATION RATIOS
R. O. Gilbert and J. C. Simpson Mar. 1984 54 p refs Presented at the Symp. on Environ. Res. for Actinide Elements, Hilton Head Island, S. Car., 7 Nov. 1984
(Contract DE-AC06-76RL-01830)
(D84-008644; PNL-21-12152; CONF-841142-1) Avail: NTIS HC A04/MF A01

This paper provides guidance on the choice of computing formulas (estimators) for estimating concentration ratios and other

ratio-type measures of radionuclides and other environmental contaminant transfers between ecosystem components. Mathematical expressions for the expected value of three commonly used estimators (arithmetic mean of ratios, geometric mean of ratios, and the ratio of means) are obtained when the multivariate lognormal distribution is assumed. These expressions are used to explain why these estimators will not in general give the same estimate of the average concentration ratio. They illustrate that the magnitude of the discrepancies depends on the magnitude of measurement biases, and on the variances and correlations associated with spatial heterogeneity and measurement errors. A computer simulation study that compares the accuracy of eight computing formulas for estimating a ratio relationship that is constant over time and/or space presented. Statistical models appropriate for both controlled spiking experiments and observational field studies for either normal or lognormal distributions are considered. DOE

N85-18491# Stockholm Univ. (Sweden). Dept. of Meteorology.
METHODOLOGY FOR THE COLLECTION AND ANALYSIS OF TRACE METALS IN ATMOSPHERIC PRECIPITATION
L. Granat and Howard B. Ross Nov. 1984 41 p refs
(Contract SWED-EPB-623-56-84-Um)
(CM-67; ISSN-0280-445X) Avail: NTIS HC A03/MF A01

The procedures used for the collection of rain water for trace metal analysis are described. Due to the low concentrations of many trace metals, measures were taken to avoid sample contamination. A clean room was built and acid washing of labware and rain collectors was begun. Graphite furnace atomic absorption spectroscopy (GFAAS) is used to determine trace metal concentrations. Detection limits for the GFAAS system are 0.002 ng Cd/ml, 0.04 ng Cu/ml, 0.02 ng Fe/ml, 0.008 ng Mn/ml, 0.04 ng Pb/ml and 0.02 ng Zn/ml. Findings on trace metal concentration in monthly atmospheric precipitation samples from two sites in southern Sweden indicate that the acid washing of labware and collectors is necessary. Contamination of samples is random and samples are more susceptible to contamination for some metals than for others. Author (ESA)

N85-18492# California State Dept. of Transportation, Sacramento. Office of Transportation Lab.
MEASUREMENT AND ANALYSIS OF AMBIENT CARBON MONOXIDE CONCENTRATIONS FOR PROJECT-LEVEL AIR QUALITY IMPACT STUDIES Final Report
Paul E. Benson, Jim Quittmeyer, and Kim Henry Feb. 1984 134 p refs Prepared in cooperation with the Federal Highway Administration, Sacramento, Calif.
(PB85-104602/GAR; TL-604195; FHWA/CA-TL-84-01) Avail: NTIS HC A07/MF A01 CSCL 13B

Recommended procedures are given for designing project level ambient carbon monoxide (CO) monitoring studies and analyzing their results. Attention is focused on transportation related applications, although the procedures are general and can be applied to other types of air quality studies. A statistical model which uses the scheduling and duration of sampling as a means to minimize bias in estimating the second annual maximum CO concentration is developed. Two types of sampling plans are discussed: background sampling and corridor sampling. Recommendations are made regarding site selection, outlier analysis, rollback calculations and data handling. A computer program which estimates second annual maximum 1 hour and 8 hour ambient (CO) concentrations using observed maximums stratified by line of day periods is introduced. A complete set of user instructions for this program is given. GRA

N85-18493# Alaska Univ., Fairbanks. Geophysical Inst.
METEOROLOGICAL FACTORS RESPONSIBLE FOR HIGH CO (CARBON MONOXIDE) LEVELS IN ALASKAN CITIES Final Report
S. A. Bowling Oct. 1984 92 p refs
(Grant EPA-808485)
(PB85-115137/GAR; EPA-600/3-84-096) Avail: NTIS HC A05/MF A01 CSCL 13B

High winter carbon monoxide levels in Anchorage, as in Fairbanks, are due to intense nocturnal (ground-based) inversions persisting through the periods of maximum emissions and at times throughout the day. The problem is exacerbated by the large amounts of carbon monoxide emitted during cold starts at low temperatures. The Anchorage situation is unusual in that the nocturnal inversion develops most often with a substantial north-south pressure gradient and easterly geostrophic winds. The Chugach Range to the east sometimes produces a wind shadow effect in the city, and almost all the CO violations examined occurred in these conditions. Measurements of mixing heights in Fairbanks suggest that a mixing height of 10 m be considered the maximum for worst-case modeling of surface-source pollutants. GRA

N85-18494# Environmental Protection Agency, Ann Arbor, Mich.
EVALUATION OF THE PARTICULATE LEVELS OCCURRING UNDER 1.0/1.2 g/mi NITROGEN OXIDE STANDARDS FOR LIGHT DUTY DIESEL VEHICLES AND LIGHT DUTY DIESEL TRUCKS
Rebecca Kanner May 1984 11 p ref
(PB85-115939/GAR; EPA/AA-SDSB-84-2) Avail: NTIS HC A02/MF A01 CSCL 13B

This report compares the projections of particulate emissions at low levels of Nitrogen Oxide (NOx) made in the EPA Diesel Particulate study to actual 1984 California certification barticulate levels. GRA

N85-18495# Environmental Sciences Research Lab., Research Triangle Park, N.C.
ATMOSPHERIC ACIDIFICATION CHEMISTRY: A REVIEW
J. L. Durham and K. L. Demerjian Jul. 1984 22 p refs
(PB84-215490; EPA-600/D-84-188) Avail: NTIS HC A02/MF A01 CSCL 13B

Atmospheric acidification is the result of the oxidation of sulfur, nitrogen and organic compounds to form their corresponding acids. The gas and aqueous phase pathways depend on the production of oxidizing free radicals (HO, CH3Oh2) that react directly with those compounds or produce molecular oxidants. The most important molecular oxidants are H2Oh2, organic peroxides, and Oh3. Except for Oh3-olefin reactions, these molecular oxidants are not reactive in the gas phase, but they are highly reactive in the aqueous phase with dissolved reductants. Thus, the molecular oxidants may be generated in a photochemically active region and transported long distances before reacting with dissolved reductants in the aqueous phase, such as fogs, clouds, and rain. Changes in H2SOh4 and HNOh3 atmospheric production rates are expected to be a function of changes in the emission rates of SOh2, Noh(subx), and VOhC. A reduction in emission rate of SOh2 will lead to a reduction in gas phase production of H2S-Oh4. However, if SOh2 concentration exceeds that of H2Oh2 reduction in SOh2 emissions may not lead to a reduction in aqueous phase production of H2SOh4. Effective control of H2Oh2 production is dependent on scientific advances to determine its formation mechanisms and rates. Author

N85-18185# Yamaguchi Univ. (Japan). Dept. of Chemical Engineering.
MECHANISM AND PROCESS OF FLOCCULATION BY POLYMERIC FLOCCULANT
Kunihisa Osasa, Masao Sambuichi, and Hideo Nakakura *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 215-224 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-18496 Danish Space Research Inst., Lyngby.
MORPHOLOGY OF keV-ELECTRONS IN THE EARTH'S MAG-

NETOSPHERE AS OBSERVED BY GEOS 1
A. Bahnsen, M. Jespersen, T. Neubert, P. Canu (Centre National d'Etudes des Telecommunications, Issy les Molineaux, France), H. Borg (Kiruna Geophysical Inst., Sweden), and P. E. Frandsen (Denmark Univ., Lyngby, Denmark) 1984 43 p refs Submitted for publication
(DRI-3-84; ISSN-0109-6605) Avail: Issuing Activity

Data on electrons between 0.3 and 22 keV collected by GEOS 1 were used to obtain the statistical distribution of electrons in the outer magnetosphere, from 4 to 21 hours local time and from 4 to 8 in L-values. More than 80% of the data could be fitted to a sum of two Maxwell distributions. The temperatures group around 0.45 and 6.5 keV, whereas the densities as well as the energy flux vary strongly with activity level and with local time. Densities at 90 deg pitch angle are consistently larger than densities at 15 deg by a factor of roughly 2.5, indicating that anisotropic pitch angle distributions are prevalent in the outer magnetosphere. The low energy and high energy densities follow the same trends with respect to variation with local time and activity level. Data collected in the afternoon hours and around L = 6 deviate from the main body of data in that fitting is often unsuccessful and densities are generally higher. R.S.F.

N85-18497 Stanford Univ., Calif.
VELOCITY STACK AND SLANT STACK INVERSION METHODS Ph.D. Thesis
Jeffrey R. Thorson 1984 157 p
Avail: Univ. Microfilms Order No. DA8420628

An important step central to the analysis of reflection seismic data is NMO (normal moveout) and stacking. This process involves the summation of seismic data over paths represented by a family of hyperbolas. It is a linear transformation, essentially singular, and maps the data into what might be called a velocity space: a two-dimensional plane indexed by time and velocity. The examination of the data in velocity space is useful for the analysis of subsurface velocities and the filtering out of undesired coherent events (multiples). But the filtering step can only be applied if an approximate inverse to the NMO and stack operation is available. Current standard processing makes the implicit assumption that the operator L(t) (defined to be NMO and stacking) and its adjoint L are an inverse pair. Replacing L(t) with a closer estimate of the inverse to L makes possible more accurate velocity filtering and a better discrimination between signal and noise in velocity space. Two approaches are taken to estimate the inverse to L.
Dissert. Abstr.

N85-18498 Texas Univ., El Paso.
GEOLOGY OF THE BATOPILAS MINING DISTRICT, CHIHUAHUA, MEXICO, VOLUMES 1 AND 2 Ph.D. Thesis
Gregg Wilkerson 1983 970 p
Avail: Univ. Microfilms Order No. DA8420096

The Batopilas mining district is located in the southwestern portion of Chihuahua, Mexico in highly dissected terrain consisting largely of Cretaceous and Tertiary intrusive and extrusive rocks of intermediate to felsic composition, forming the upper and lower igneous series of the Sierra Madre. An early, 85 MY granodioritic phase was followed by Tertiary quartz dioritic phase at 50 MY, and another granodioritic phase at 45 MY. The upper volcanic series occurred at 28 MY. A map of the surface geology eas made at a scale of 1:25,000 covering an area of 60 sq km. The Batopilas area was near the source of several of the igneous stages which vented, resulting in great variability in extrusive units. An intrusive phase associated with the 45 MY Las Tahonas unit developed a small porphyry copper deposit to the west of the town, which is presently in a stage of excellent exposure. The numerous silver deposits occur in a broad arc around the prophyry and several kilometers out. The silver zone is separated from the porphyry by a poor quartz-galena zone. Several genetic models of Batopilas mineralization are discussed. Dissert. Abstr.

N85-18499 Brown Univ., Providence, R. I.
THE MIDWAY ATOLL CORAL CAP: METEORIC DIAGENESIS, AMPLITUDE OF SEA-LEVEL FLUCTUATION AND DOLOMITIZATION Ph.D. Thesis
Richard Paul Major 1984 146 p
Avail: Univ. Microfilms Order No. DA8422456

A continuously cored borehole through the bank margin of the Midway Atoll coral cap provides a record of post-early Miocene eustasy. Subaerial exposure horizons are identified by light carbon isotope signatures and, in some instances, by lithologic criteria. Sea-level highstands are recorded by aggradational units of reef sediment that are bounded by these subaerial horizons. Sea-level lowstands are constrained to fall no farther than a meteoric-marine diagenetic boundary observed in the core. This diagenetic boundary is defined by an offset in both oxygen and carbon isotope data, light isotopic composition being indicative of intermittent meteoric diagenesis. Application of this analytic approach may provide amplitude constraints on eustasy elsewhere in the geologic record. Portions of the bank margin core are partially to completely dolomitized. Dolomites are isotopically enriched relative to stratigraphically adjacent calcite. Dissert. Abstr.

N85-18500 Wisconsin Univ., Madison.
GLACIAL GEOLOGY OF BARRON COUNTY, WISCONSIN Ph.D. Thesis
Mark Dale Johnson 1984 391 p
Avail: Univ. Microfilms Order No. DA8415563

The glacial geology of Barron County consists of deposits and landforms associated with at least seven glacial advances. The Des Moines Lobe advanced into Barron County (the Reeve advance) probably several hundred thousand years ago and deposited olive-black loam till (till of the Pierce Formation) in the western third of the county. Following a period of weathering, ice of the Superior Lobe advanced (the Baldwin advance) and deposited yellowish-red sandy-loam till (till of an unnamed member of the River Falls Formation) concurrently with the Chippewa Lobe that advanced (the Dallas advance) and deposited yellowish-red sandy-loam till (till of the Prairie Farm Member of the River Falls Formation). These advances occurred after the Reeve advance and probably before the Wisconsin Glaciation. Weathered magnetite and clay minerals indicate that these till units were weathered for a long time following these advances. The remaining four advances into Barron County Occurred during the last part of the Wisconsin Glaciation. Each advance deposited yellowish-red sandy-loam till. Dissert. Abstr.

N85-18501 Michigan Univ., Ann Arbor.
DYNAMICS OF THE LOW-LATITUDE THERMOSPHERE AND IONOSPHERE Ph.D. Thesis
Roger George Burnside 1984 234 p
Avail: Univ. Microfilms Order No. DA8422202

Nighttime thermospheric neutral wind velocities were determined at Arecibo, Puerto Rico, by using a Fabry-Perot interferometer, which measures the Doppler shift of the O(1D) airglow emission. In summer, the winds are observed to flow toward the southeast between sunset and midnight. After midnight in summer, the meridional component of the wind usually slackens, while the zonal component may reverse. By contrast, in winter, the meridional wind is often small, and the predominant flow is eastward throughout the night. Incoherent scatter radar measurements are used to calculate the O(+) diffusion velocity and infer the vertical profile of the meridional wind. Horizontal temperature gradients and ion-drag forces are evaluated from radar measurements. Electrical conductivities of the E and F layers of the nighttime ionosphere are determined. The F layer Pedersen conductivity at the magnetically conjugate point is evaluated using ionosonde data. The F layer dynamo mechanism is found to be the source of most of the nighttime electric fields observed at Arecibo. The factors that determine the electron density at the F layer peak are investigated by evaluating the various terms in the O(+) continuity equation. Dissert. Abstr.

N85-18502 Rutgers - The State Univ., New Brunswick, N. J.
A TURBULENT CLOSURE MODEL FOR THE FREE ATMOSPHERE Ph.D. Thesis
Aharon Oren 1984 138 p
Avail: Univ. Microfilms Order No. DA8424138

A second order closure model for atmospheric, three-dimensional, steady, turbulent flow is solved using an iterative procedure. The primary goal of this work is to construct a simple model for the energy conversion between the mean and the fluctuating flows. A static stable temperature profile was imposed in order to prevent baroclinic instability growth. The eddy kinetic correlations (i.e., <uu>; <uv> and <vv> were found to be, primarily, related to the eddy kinetic energy and the zonal shear, which caused the velocity scale to dominate the problem. The significance of the length scales and the buoyancy time scale were checked, and revealed that the flow field had been moderately affected by those changes. It is shown that a generation term of eddy potential energy is an essential part in the energy cycle and without it, an unrealistic temperature profile is created.
Dissert. Abstr.

N85-18503 Virginia Polytechnic Inst. and State Univ., Blacksburg.
LATE PRECAMBRIAN TO ORDOVICIAN METAMORPHISM AND OROGENESIS IN THE BLUE RIDGE AND WESTERN PIEDMONT, VIRGINIA APPALACHIANS Ph.D. Thesis
Nicholas Hartford Evans 1984 322 p
Avail: Univ. Microfilms Order No. DA8421861

Geologic mapping, metamorphic petrology and structural analysis have elucidated Late Precambrian to Middle Ordovician tectonics in the Virginia Blue Ridge and western Piedmont. The Blue Ridge basement complex in central Virginia comprises the contrasting Lovingston and Pedlar lithologic terranes. The Pedlar (NW of the Rockfish Valley fault) contains granulite-Facies gneiss and granofels of Grenville and pre-Grenville age. The Lovingston (SE of the Rockfish Valley fault) contains Grenville and pre-Grenville age granofels and gneiss with predominantly greenschist-facies mineral assemblages, intruded by granodiorite and gabbro of the Late Precambrian Crossnore Group. Lithofacies in cover rocks on the northwest and southeast limbs of the Blue Ridge suggest that the areal extent of post-Grenville metamorphism in the basement complex, and the distribution of Crossnore igneous rocks, are related to the geometry of Latest Precambrian to Cambrian rifting where the hinge zone, or landward limit of crustal attenuation, coincided with the present axis of the Blue Ridge at the latitude of central Virginia. Dissert. Abstr.

N85-18504 Iowa Univ., Iowa City.
QUATERNARY STRATIGRAPHY OF THE LOWER IOWA AND CEDAR RIVER VALLEYS, SOUTHEAST IOWA Ph.D. Thesis
Steven Paul Esling 1984 509 p
Avail: Univ. Microfilms Order No. DA8423556

This study investigates the extensive terraces along the lower Iowa and Cedar Rivers, southeastern Iowa. Three stratigraphically distinct terrace systems are recognized and designated (with decreasing age), the Early Phase High Terrace (EPHT), Late Phase High Terrace (LPHT), and Low Terrace (LT) systems. Previous investigations attributed EPHT and LPHT deposits along the Iowa River and LT deposits along the Cedar River to the hypothetical, Illinoian, proglacial Lake Calvin. However, these terraces are composed of alluvium overlain by Wisconsinan and Holocene eolian and colluvial deposits which are too young to be associated with an Illinoian lake. There is no stratigraphic or sedimentologic evidence that supports the existence of Lake Calvin. Loess, eolian sand, and local alluvial and colluvial facies, totalling 6 - 9 m thick, mantles the EPHT. A buried incipient soil, which dates at circa 17,000 - 21,000 Y.B.P. is developed at the base of this surficial package. Dissert. Abstr.

N85-18505 Washington State Library, Olympia.
STRUCTURAL MORPHOLOGY AND ASSOCIATED STRAIN WITHIN PARTS OF THE US SECTION OF THE KOOTENAY ARC, NE, WASHINGTON Ph.D. Thesis
Michael Alexander Ellis 1984 275 p
Avail: Univ. Microfilms Order No. DA8422989

The Kootenay Arc is structurally characterized by two dominant fold geometries: first generation folds are generally isoclinal, overturned to both the E and W, associated with a penetrative axial planar cleavage, and trend parallel to the arc's length. Second generation folds are generally coaxial to the earlier folds, upright to overturned to both E and W, and become progressively nono-cylindrical higher in the stratigraphy. The Kootenay Arc is here interpreted as an asymmetrical pop-up, or east facing crustal horse. In this context, the Shuswap terrain is seen as the western limit of the Mesozoic N. American craton, and as the first horse to form as the continent was subducted beneath a convex east overriding plate. Numerical analysis concerning the development of small circle mica fabrics shows that, from an initially uniform population, small circle mica fabrics are only obtainable when the initial aspect ratio of the mica is less than about 2:1.
Dissert. Abstr.

N85-18506 Illinois Univ., Urbana-Champaign.
PETROGRAPHY, DIAGENESIS AND DEPOSITIONAL MODELS OF THE ST. LOUIS LIMESTONE, VALMEYERAN (MIDDLE MISSISSIPPIAN), ILLINOIS BASIN, USA Ph.D. Thesis
Ibrahima Diaby 1984 198 p
Avail: Univ. Microfilms Order No. DA8422053

Detailed petrography of 1542 oriented thin sections led to recognition of 16 carbonate microfacies. The vertical succession, reciprocal (lateral and vertical) relationships and correlation coefficients of the microfacies permitted construction of three depositional models. The depositional models follow chronologically expressing a propagation of the medium to high energy arbonates towards the depocenter. Near the margins of the basin (SE and E), model 1 was active throughout St. Louis time. Away from the basin edge, model 1 (baffle zone) evolved into model 2 (bioclastic bar) which in turn changed to the oolitic bar-to-bank system of model 3 which remained active till the close of St. Louis time. Probably the depocenter corresponded to a continous deposition of basinal bioclastic calcisiltites. The diagenetic features observed petrographically, represent changes that took place in the following environments; marine phreatic, marine vadose, undersaturated freshwater phreatic, saturated freshwater phreatic, mixing marine-freshwater phreatic and, burial. Dissert. Abstr.

N85-18507 Illinois Univ., Urbana-Champaign.
PETROGRAPHY, SEDIMENTOLOGY, DIAGENESIS, AND RESERVOIR CHARACTERISTICS OF SOME PENNSYLVANIAN PHYLLOID ALGAL LIMESTONES: KANSAS AND UTAH, USA Ph.D. Thesis
William Craig Dawson 1984 269 p
Avail: Univ. Microfilms Order No. DA8422049

The Paola and Raytown limestone members of the Iola Formation of southeastern Kansas were systematically analyzed. These rocks contain a typical Pennsylvanian biotic assemblage of phylloid algae, bryozoans, encrusting foraminifers, fusulinids, Composita, productid brachiopods, and pelmatozoans. Quantitative petrographic data indicate that the Iola Formation consists of 23 carbonate and one siliciclastic microfacies. The paleoenvironmental evolution of Iola microfacies records a shallowing-upward sequence ranging from far offshore environments dominated by biogenic reworking to intertidal storm-dominated conditions. A phylloid algal mound within the Raytown limestone is of mixed hydrodynamic-biogenic origin and exhibits four growth stages: (1) bioclastic (hydrodynamic buildup); (2) bioaccumulation; (3) bioconstruction; and (4) bioclastic (destructional). Phylloid algal reservoirs in the Ismay Field, Utah are characterized by high porosity and low permeability. Most porosity results from selective dissolution of phylloid algae but abundant micropores in the micritic matrix impart a size bimodality to the pore system. Permeability may be enhanced by stylolites or microfractures. Dissert. Abstr.

N85-18508 Michigan Univ., Ann Arbor.
DIAGENESIS OF NIAGARAN (MIDDLE SILURIAN) PINNACLE REEFS, NORTHWEST MICHIGAN Ph.D. Thesis
Karen Rose Cercone 1984 382 p

Avail: Univ. Microfilms Order No. DA8422204

The presence of geothermal gradients 10 to 20 C higher than the current average gradient (25 C/km), and of one kilometer of now eroded overburden in the Michigan Basin during the Paleozoic can be inferred from the high organic maturity of basin strata using the Lopatin method. These data are used to reconstruct the burial history of a single pinnacle reef from northwest Michigan, allowing absolute time constraints to be placed on reef diagenesis. Partial dolomitization occurred during subaerial exposure just after reef growth; regional dolomitization occurred between the late Silurian and the Devonian; and late mineralization by calcite, dolomite and pyrite occurred after Mississippian hydrocarbon emplacement and before the end of the Jurassic. There is no evidence that a well-developed fresh-water lens was ever present in this reef. Regional controls on carbonate diagenesis in this northwest reef trend include: size and hydraulic conductivity of reefs, thickness and lithology of adjacent and overlying evaporites, migration paths of late gypsum-derived and basinal brines, and the timing of anaerobic fermentation in organic-rich carbonates.
Dissert. Abstr.

N85-18509 Wisconsin Univ., Madison.
THE PLEISTOCENE GEOLOGY OF VILAS COUNTY, WISCONSIN Ph.D. Thesis
John William Attig, Jr. 1984 310 p
Avail: Univ. Microfilms Order No. DA8415544

The Wisconsin Valley, Langlade and Ontonagon Lobes of the Laurentide Ice Sheet flowed across all or part of Villas County between 23,000 and 10,000 years ago. These lobes deposited the Wildcat Lake, Nashville and Crab Lake Members of the Cooper Falls formation respectively. Each member is defined by the physical characteristics of a till, and each member also contains supraglacial debris flow sediment, and subglacial and proglacial fluvial sediment. A number of former ice margin positions are indicated in Vilas County by moraines and the ice contact slope of fluvial landforms. Regional correlation shows that the Langlade and Green Bay Lobes remained near their maximum Late Wisconsin extent when the Wisconsin Valley and Chippewa Lobes had retreated up to 100 km. The Ontonagon Lobe advanced into northern Vilas County and deposited the Winegar Moraine, probably just before growth of the Two Creeks Forest Bed in east central Wisconsin.
Dissert. Abstr.

N85-18510 Texas Univ., El Paso.
STRATIGRAPHY OF EARLY ORDOVICIAN EL PASO GROUP OF THE SOUTHERN HUECO MOUNTAINS, HUDSPETH COUNTY, TEXAS Ph.D. Thesis
Maduegboaka Innocent Jude Aluka 1984 520 p
Avail: Univ. Microfilms Order No. DA8420094

The Early Ordovician El Paso Group of the southern Hueco Mountains, Hudspeth County, Texas, crops out over an area of about 57 sq km. (22 sq mi) at longitude 105 deg. 53 min. 30 sec. latitude 31 deg. 40 min. 15 sec and 31 deg 47 min. 30 sec. N. It is divided into three informal units (oldest to youngest): lower, middle and upper. The lower unit contains the lower calcareous sandstone member and an overlying sandy limestone member. The middle unit is cherty limestone. The upper unit contains two members: sandy dolomite and an upper silty dolomite. The calcareous sandstone member is 36 m (118 ft) thick and conformably overlies the Bliss Sandstone. It is thin- to medium-bedded, grayish-orange-pink to pale-blue, glauconitic, dolomitic, and siliciclastic sandstone. The calcareous sandstone member was deposited in subtidal and intertidal environments and is to Early Early Ordovician age.
Dissert. Abstr.

N85-18511 Dartmouth Coll., Hanover, N.H.
PART 1. STRATIGRAPHY, STRUCTURE AND PETROLOGY OF THE PETERBOROUGH 1.5-MINUTE QUADRANGLE, NEW HAMPSHIRE AND PART 2. GRAPHITE TEXTURAL AND ISOTROPIC VARIATIONS IN PLUTONIC ROCKS, SOUTH-CENTRAL NEW HAMPSHIRE Ph.D. Thesis
Edward F. Duke 1984 210 p
Avail: Univ. Microfilms Order No. DA8425162

The stratigraphy of the Merrimack Synclinorium in the Peterborough quadrangle is reinterpreted and correlated with fossil dated Silurian-Lower Devonian strata of western Maine. The earliest phase of the Acadian Orogeny produced west directed fold thrust nappes in this area. The Kinsman Quartz Monzonite was intruded along axial surfaces of these structures, locally establishing peak metamorphic conditions in the wall rocks. Intrusion of the Kinsman was closely followed by mafic intrusions of the Spaulding Quartz. Dorite possibly accompanying west northwest F sub 2 folding, and peak metamorphic conditions were reached in adjacent rocks. Graphite occurs in two distinct textural varieties in syntectonic granifolds of the New Hampshire Plutonic Series and in associated metasedimentary wall rocks. Textural characteristics indicate that coarse graphite flakes (0.1 to 1.0mm) were present at an early stage of crystallization of the igneous rocks and may represent xenocrystic material assimilated from the wall rocks.Dissert. Abstr.

N85-18512 Oregon State Univ., Corvallis.
CORRELATION AND PETROLOGICAL INTERPRETATION OF ABYSSAL AND TERRESTRIAL TEPHRA LAYERS Ph.D. Thesis
Alan Neil Federman 1984 252 p
Avail: Univ. Microfilms Order No. DA8425997

Chemical analyses of distal tephra components from the 1912 eruption of Novarupta, Alaska, indicate both glass and mineral compositional heterogeneity. A combination of a 150 C range in temperature deduced from iron-titanium oxide geothermometry, and non-linear major element correlation plots of glass compositions indicate that a chamber of compositionally zoned magma existed prior to the eruption. Results for these distal tephras are comparable to those from a recently completed study at the source. Eruptions from chambers of zoned magma may account for many of the heterogeneous tephra layers in the Gulf of Alaska. Studies of the geochemistry of distal volcanoes are based on the assumption that no chemical exchange has taken place between the glass and adjacent pore water. Study of 116 samples of both primary air-fall and alluvially reworked tephra layers on the Columbia River Plateau of South-central Washington state revealed 16 groups of compositionally distinct layers.
Dissert. Abstr.

N85-18513 Wisconsin Univ., Madison.
STRUCTURE AND STRATIGRAPHY OF MIDTERHUKEN PENINSULA, BELLSUND, WEST SPITSBERGEN Ph.D. Thesis
Armon Droge Maher 1984 491 p
Avail: Univ. Microfilms Order No. DA8415569

A natural transect of the Tertiary fold-and-thrust belt along Spitsbergen's west coast is exposed on Midterhuken peninsula. The deformation involves two main geologic sequences. Basement rocks on Midterhuken's western tip (Hecla Hoek sequence) were metamorphosed and penetratively deformed during the Caledonian orongeny, and were uplifted and tilted during Tertiary deformation. To the east is a Lower Carboniferous to Cretaceous plaatform cover sequence (2 km thick) of unmetamorphosed carbonate and clastic rocks; it unconformably overlies the Hecla Hoek rocks, and forms a northeast-dipping homocline with locally complex structures. Except for one significant structural repetition of beds, successively younger stratigraphic units are exposed eastward. Tertiary tectonism occurred as the Barents Shelf moved dextrally past northeast Greenland on a transform fault linking spreading in the Arctic and Norwegian-Greenland Seas. The transcurrent plate setting and the compression nature of Tertiary deformation along Spitsbergen's west coast are reconciled by postulating that transpression (combined strike-slip and convergent plate movement) was decoupled. The strike-slip movement is largely concealed offshore and the lateral compression is exposed onshore.
Dissert. Abstr.

N85-18514 Arizona Univ., Tucson.
QUATERNARY STRATIGRAPHY, GEOCHRONOLOGY AND CARBON ISOTOPE GEOLOGY OF ALLUVIAL DEPOSITS IN THE TEXAS PANHANDLE Ph.D. Thesis
Thomas Wier Stafford, Jr. 1984 180 p
Avail: Univ. Microfilms Order No. DA8424911

Sedimentology, stratigraphy, and stable carbon isotopy were used to reconstruct geologic and climatic events on the Texas southern High Plains from ca. 13,000 yr B.P. to the present. The alluvial sediments in Yellowhouse and Blackwater Draws were used to construct the geologic history. The oldest valley alluvium comprises more than 13,000 yr B.P. fluvial sediments that were incised and buried by fluvial and lacustrine mediments dating ca. 13,000 to 4900 yr B.P. Lucustrine waters changed from ologotrophic to eutrophic and finally calcalitrophic. Regional valley erosion at 4900 yr. B.P. developed a widespread disconformity within the Yellowhouse Draw formation, which separates lower fluvial and lacustrine sediments (ca. 13,000 to 4900 yr B.P.) from the overlying sediments dating 4900 yr B.P. to present. After 4900 yr B.P., intermittent streams and eolian processes deposited several meters of sand the length of each valley. Clenegas returned to downstream reaches of both draws after 1500 to 2000 yr B.P. Dissert. Abstr.

N85-18515 Florida Univ., Gainesville.
GENERATION AND EVOLUTION OF DIABATIC PLANETARY WAVES IN CONTINUOUSLY STRATIFIED ATMOSPHERE WITH EKMAN DISSIPATION Ph.D. Thesis
Bin Wang 1984 166 p
Avail: Univ. Microfilms Order No. DA8424616

The model presented extends Charney (1947) model by including Newtonian cooling, Ekman dissipation, linear vertical variation of the stratification parameter and nonlinearity. The unstable Green modes are similar in many respects to the transient planetary waves: They tilt westward with height in the troposphere and feature a barotopic structure in the stratosphere. They may extend up to 5-6 scale heights before being trapped and exhibit a major peak in the stratosphere. The wavelength (growth rate) of the most unstable Green mode is about three times (1/3 to 2/5) of that of the most unstable Charney mode. Its available potential energy is converted in the lower troposphere, as well as in the stratosphere, and its kinetic energy is generated in both the middle troposphere and the middle stratosphere, with significant destruction near the tropopause. The vertical increase of the static stability reduces the wavelength of the most unstable modes and affects considerably the growth rate and vertical structure of the Green modes. Dissert. Abstr.

N85-18516 Arizona Univ., Tucson.
CARBON DIOXIDE LASER RADAR FOR MONITORING ATMOSPHERIC TRANSMITTANCE AND ATMOSPHERIC AEROSOL Ph.D. Thesis
David Michael Winker 1984 268 p
Avail: Univ. Microfilms Order No. DA8424936

An incoherent CO2 laser radar, or lidar, system using a tunable CO2 TEA laser was developed, along with analytical techniques to permit the eterminations of atmospheric transmittance and aerosol backscatter from multi-angle lidar returns. This work was motivated by the need for a more complete knowledge of the optical properties of the atmosphere in the 9 to 11 micron spectra region. Results of preliminary observations are discussed. CO2 lidar systems were used before to measure backscatter and transmittance. Here, a new analytic method is developed, applicable to the 8-12 micron window region in conditions of high visibility, when the aerosol component of extinction is negligible compared to the molecular component. In such cases the backscatter sensed by the system is due to the atmospheric aerosol while atmospheric transmittance is determined by molecular species such as carbon dioxide and water vapor. Dissert. Abstr.

N85-18517*# Harvard Coll. Observatory, Cambridge, Mass.
LYMAN ALPHA CORONAGRAPH RESEARCH SOUNDING ROCKET PROGRAM Final Report, 15 Jul. 1976 - 28 Feb. 1985
W. H. Parkinson and John L. Kohl Feb. 1985 38 p refs
(Grant NsG-5128)
(NASA-CR-174376; NAS 1.26:174376) Avail: NTIS HC A03/MF A01 CSCL 04A

The ultraviolet light coronagraph was developed and successfully flown on three rocket flights on 13 April 1979, 16 February 1980 and 20 July 1982. During each of these flights, the Ultraviolet Light Coronagraph was flown jointly with the White Light Coronagraph provided by the High Altitude Observatory. Ultraviolet diagnostic techniques and instrumentation for determining the basic plasma parameters of solar wind acceleration regions in the extended corona were developed and verified and the understanding of the physics of the corona through the performance, analysis and interpretation of solar observations advanced. Valuable UV diagnostics can be performed in the absence of a natural solar eclipse. Author

N85-18518# RAND Corp., Santa Monica, Calif.
VERIFICATION OF A MODEL OF THE EASTERN SCHELDT
Jan J. Leendertse Apr. 1984 137 p refs Sponsored by The Netherland Rijkswaterstaat
(Rand/R-3108-NETH; LC-84-8261; ISBN-0-8330-0564-2) Avail: NTIS HC A07/MF A01

The accuracy of two-dimensional computational models used to study tide and long water wave propagation in relatively shallow coastal water was determined by comparison of hydraulic model and computational model verification simulations for the same model area, and for the same simulation period, together with the availability of prototype data. The results of the experiments and their comparisons are reported. Simulation results indicate a very good agreement between observed and computed transport rates through the Hammen, Schaar, and Roompot. A good agreement between observed and computed water levels was also obtained. The simulation in which the pressures resulting from salinity were included had a better agreement with observed data than the simulation without the salinity. An analysis of the different component was the most difficult to reproduce the model. A.R.H.

N85-18519# Hawaii Univ., Honolulu.
PHYSICAL CHARACTERIZATION OF MAGMA Progress Report
M. H. Manghnani 1984 7 p refs
(Contract DE-AT03-82ER-12099)
(DE85-000568; DOE/ER-12099/T1) Avail: NTIS HC A02/MF A01

Progress is reported in the following research areas: (1) elastic and anelastic properties of basalt melts; (2) electrical conductivity of Kilauea Iki samples; and (3) physical and thermal properties. DOE

N85-18520# Geological Survey, Baton Rouge, La.
RESULTS FROM GEOPRESSURED-GEOTHERMAL SUBSIDENCE STUDIES
D. B. Trahan 1984 19 p refs
(Contract DE-AC08-81NV-10174)
(DE84-016279; DOE/NV-10174/T1) Avail: NTIS HC A02/MF A01

Benchmark networks were installed around each of the US Department of Energy geopressured-geothermal test sites in southwestern Louisiana. These networks are periodically surveyed to detect subsidence which may be attributable to depressurization of the geopressured-geothermal reservoirs. The acquired leveling data was adjusted to account fo regional base-line movement determined in another study. The effects of geopressured-geothermal development can only be assessed after carefully examining other potential causes of subsidence. The histories of oil and gas production and ground-water withdrawal around the geopressured-geothermal test site at Parcperdue indicate that oil, gas, and ground-water production may contribute much more to anomalous subsidence than recent geopressured-geothermal brine production. A trend-surface analysis of leveling data for the Parcperdue test site allowed for the separation of a regional component of movement attributable to uplift in the Iberian structural axis to the east and subsidence above a Pleistocene depocenter to the west of the test site. Residual deviations from the regional trend may be associated with the temporary loading and compaction of surface soils caused by the weight of drilling equipment and with ground-water withdrawal. DOE

N85-18521# Department of Energy, Oak Ridge, Tenn. Technical Information Center.
ATMOSPHERIC SCIENCE AND POWER PRODUCTION
Darryl Randerson, ed. (NOAA) Jul. 1984 855 p refs
(DE84-005177; DOE/TIC-27601) Avail: NTIS HC A99/MF A01

Recent contributions made by atmospheric science to the analysis of air quality and results originating from research conducted and completed in the 1970s are presented. The contribution of atmospheric science to solving problems relating to the fate of combustion products released into the atmosphere is emphasized. Atmospheric physics and field experiments are described to provide an overview of atmospheric boundary layer processes, of how air flows around obstables, and of the mechanism of plume rise. Atmospheric chemistry and removal processes are detailed to provide knowledge on how gases and particulate matter can be transformed while in the atmosphere and how they can be removed from the atmosphere. The application air quality models to solve a wide variety of problems is reviewed. DOE

N85-18522# Kiruna Geophysical Inst. (Sweden).
SIMULTANEOUS OBSERVATIONS OF ELECTRON SPECTRA IN THE AURORAL ZONE AND NEAR THE EQUATORIAL PLANE BY THE DMSP-5D-F2 AND GEOS-1 SATELLITES
Martin Townend (Sussex Univ., Brighton, England) and Mats Andre Jul. 1984 22 p refs Sponsored by UK Science and Engineering Research Council
(KGI-184; ISSN-0347-6405) Avail: NTIS HC A02/MF A01

Simultaneous observations of differential particle number fluxes in the auroral region by the DMSP-5D-F2 satellite and in the conjugate equatorial plane by GEOS 1 are studied. It is found that spectra in the precipitation region and in the plasma sheet can be similar in shape and magnitude. The features of auroral electron precipitation can be determined by the particle characteristics in the conjugate equatorial plane, and dumping of particles occurs without any significant acceleration by electric fields parallel to the Earth's magnetic field. Author (ESA)

N85-18523# Kiruna Geophysical Inst. (Sweden).
PITCH ANGLE SCATTERING AND PARTICLE PRECIPITATION IN A PULSATING AURORA: AN EXPERIMENTAL STUDY
Ingrid Sandahl Oct. 1984 163 p refs
(KGI-185; ISSN-0347-6405) Avail: NTIS HC A08/MF A01

A pulsating aurora occurring during the recovery phase of a substorm was monitored by rockets and ground-based instruments. Auroral luminosity variations are very well correlated to variations in the flux of precipitating hot electrons. The biggest energy flux modulation occur for 60 keV electrons. Model calculations suggest that electrons are scattered into the loss cone through the Doppler shifted gyroresonance with whistler mode waves. A relaxation oscillator mechanism is the most likely cause of the pulsations. Properties of the 3 + or - 1 Hz modulated fluxes are described and a qualitative model for the cause of the modulation is proposed. In a pulsating patch a trace of an electric field was measured. The electric field lags the electron energy flux by 2 sec, in agreement with the calculated ionization buildup time.
Author (ESA)

N85-18524# European Space Agency, Paris (France).
STRATOSPHERIC CONCENTRATION OF NITRIC ACID, OZONE AND CARBONYL SULFIDE: MEASUREMENT OF NITRIC ACID ABSORPTION IN THE Q BRANCH OF THE V4 BAND AS A FUNCTION OF TEMPERATURE
Sylvie LeBoiteux Oct. 1984 157 p refs Transl. into ENGLISH of "Dosage de l'Acide Nitrique de l'Ozone et du Carbonyl Sulfureux dans la Stratosphere, Mesure de l'Absorption de l'Acide Nitrique dans la Branche Q de la Bande V4 en Fonction de la Temp." Rept. ONERA-NT-1982-7 ONERA, Paris, 1982 Original language document announced as N84-27336
(ESA-TT-864; ONERA-NT-1982-7) Avail: NTIS HC A08/MF A01

Ten stratospheric species (O3, No2, OCS, NO, CH4, N2O, HCl, HF, CO, HNO3, and H2O) were simultaneously measured and infrared absorption measurements by HNO3 were recorded by instruments on an aircraft and from a balloon platform. The spectra obtained are presented and an attempt is made to evaluate a temperature dependence correction for the atmospheric spectra. Author (ESA)

N85-18525# Stockholm Univ. (Sweden). Dept. of Meteorology.
SIMULATION OF ENTRAINMENT AT THE TOP OF THE ATMOSPHERIC BOUNDARY LAYER FOR USE IN GENERAL CIRCULATION MODELS (GCM)
Hilding Sundquist Oct. 1984 32 p refs
(Grant SWED-NSRC-G-GU-2936-106)
(DM-42; ISSN-0349-0467) Avail: NTIS HC A03/MF A01

A scheme for handling condensation and clouds and entrainment simulation with a well mixed boundary layer in general circulation models is developed. Entrainment simulation is related to an entrainment velocity, the magnitude of which is a function of the cloud water content. Unrealistic condensation in the middle of a well mixed layer is avoided by not allowing condensation to appear unless the model level is in the immediate proximity of the inversion base. The scheme was tested in a one-column version of a global model. A column situated over the ocean is considered and data are chosen such that surface fluxes of heat and moisture are minimized to make the radiative cooling at the cloud tops the main motor for the turbulent motion. The results from 48 hr integrations indicate that the scheme renders a realistic evolution: the boundary layer depth increases with time, a cloud deck with realistic liquid water concentration is present at the top of the boundary layer but practically no precipitation reaches the ground.
Author (ESA)

N85-18892*# Geological Survey, Washington, D.C.
EARTH
Michael H. Carr *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 79-106 (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 08G

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-18526 Purdue Univ., Lafayette, Ind.
THE INFLUENCE OF DEEP CUMULUS CONVECTION ON LARGE-SCALE FLOW DURING AVE/SESAME 1, 10-11 APRIL 1979 Ph.D. Thesis
Thomas Quentin Carney 1984 189 p
Avail: Univ. Microfilms Order No. DA8423337

A new formulation of the Eulerian kinetic energy budget equation which contains terms representing interactions between features on different scales of motion is developed and applied to a high resolution upper air data set. The data were observed in the central United States over a 24 h period during the Atmospheric Variability. Experiment Severe Environmental Storms and Mesoscale Experiment (AVE/SESAME) on 10-11 April 1979. Three hourly soundings were taken. Two data sets were produced using Barnes' (1964, 1973) objective analysis scheme: one based on observations from 39 stations (SES), which included 23 NWS and 16 supplementary stations, and the other based on observations only at the NWS stations. Kinetic energy budget results are examined for five regions: the total analysis area; the whole convection area which is fixed and contains most of the convective activity during the 24 h period; and three sub areas, one containing the most intense convection (CB1), one containing weaker convection downwind of CB1 (CB2), and one containing no convection downwind of CB2 (NC). Dissert. Abstr.

N85-18527 Princeton Univ., N. J.
MESOSCALE LEE CYCLOGENESIS Ph.D. Thesis
Wen-Dar Chen 1984 181 p
Avail: Univ. Microfilms Order No. DA8417443

Atmospheric cold fronts interacting with topography may produce a great deal of severe weather along their paths. Mesoscale lee cyclogenesis is observed as one of the most

prominent phenomena. Cyclogenesis on the lee side of the Andes is investigated through three methods, i.e., rotating tank experiments, and analytic and numerical simulations. The Andes is represented by a ridge type barrier. First, the case of barotropic zonal flow over the ridge is investigated using three methods. Next, a zonally symmetric front moving equatorward without barriers is studied using both rotating tank and analytic simulations. Finally, a moving front which interacts with the barrier and is aligned perpendicular to the ridge is simulated through rotating tank and numerical simulations. Dissert. Abstr.

N85-18528 Texas Univ., Austin.
ON THE FORMATION OF THE NOCTURNAL COASTAL SURFACE WIND SPEED MAXIMUM Ph.D. Thesis
Hyo Choi 1984 82 p
Avail: Univ. Microfilms Order No. DA8421680

Diurnal variations of coastal surface wind speed are analyzed with five years of hourly wind data. Observations at Port Aransas, Texas show a nighttime wind speed maximum about 63% of the time on the annual average. Frequency varies from about 73% in summer (May through August), to 61% in the transition season (March, April, September, and October), and 57% in winter (November through February). The coastal wind maximum occurs most frequently near midnight (0000 CST) and with a minimum in the afternoon (1300 to 1400 CST). In summer the coastal maximum wind occurs predominantly with a southerly component with 91% of the total number of occurrences for this season. In the transition season 64% of the maximum winds occur with a southerly component whereas in winter a southerly component maximum wind occurs with only about 39% of the total occurrence for the season. On a yearly average, the nighttime wind maxima with a southerly component occurred about 3 times more frequently than with a northerly component. Dissert. Abstr.

N85-18529 Virginia Univ., Charlottesville.
BEHAVIOR AND CHARACTERISTICS OF STORM COLD OUTFLOWS Ph.D. Thesis
Omar Abel Lucero 1983 308 p
Avail: Univ. Microfilms Order No. DA8419914

The governing dynamics of storm cold outflows was studied using a hydrostatic cold outflow model and the results verified against observations. Results indicate that asymmetries in wind pattern inside the cold outflow and in spreading are produced by the constant modification of the pressure field inside the cold outflow caused by the movement of the downdraft. The cold outflow can maintain its maximum depth up to a threshold travel speed of the downdraft. For downdrafts traveling faster than the threshold speed, which depends on the downdraft's rate of discharge, that maximum depth decreases. The rate of spread of a cold outflow is also profoundly influenced by the downdraft's travel speed. Analysis of pressure and surface winds beneath strong convection during the arrival of two downbursts at the ground showed that they satisfy the Bernoulli equation. This is interpreted to indicate that pressure forces play an important role in the occurrence of surface windburst caused by the arrival of a downburst. Dissert. Abstr.

N85-18530 Ohio State Univ., Columbus.
A POSSIBLE MECHANISM FOR THE DIURNAL OSCILLATIONS OF TROPICAL CYCLONES Ph.D. Thesis
Jay Stanley Hobgood 1984 168 p
Avail: Univ. Microfilms Order No. DA8426404

A possible mechanism for the diurnal oscillations of tropical cyclones is presented. In the conceptual model developed to explain these features, the diurnal pattern of net radiation at the cloud tops is identified as the primary cause of the oscillations. Greater radiative cooling of the cloud tops at night steepens the lapse rate and increases convection. This generates a slight intensification in the storm. The reverse occurs during the daytime as the cloud tops absorb solar radiation. This conceptual model is tested through the use of a numerical model. The basic model reproduces well the development of a strong hurricane from a weak tropical depression. The model storm exhibits strong, cyclonic low level inflow and weaker anticyclonic upper level outflow. In addition, spiral rain bands and an eye are observed during the simulation. Dissert. Abstr.

N85-18531 Ohio State Univ., Columbus.
AN ANALYSIS OF THE SEASONAL VARIATIONS IN THE WATER VAPOR TRANSPORT FIELDS OVER THE SOUTHERN HEMISPHERE Ph.D. Thesis
David A. Howarth 1984 240 p
Avail: univ. Microfilms Order No. DA8426410

Seasonal mean fields of precipitable water, the zonal and meridional components of the vertically integrated water vapor flux field and the water vapor flux divergence are calculated and mapped from five years of Southern Hemisphere data for the period 1 September 1973 through 31 August 1978. Data are the product of a numerical analysis procedure developed and implemented by the Australian Numerical Meteorological Research Center and are in the form of 47 by 47 matrices superimposed on a polar stereographic projection. Magnitudes of the mixing ratios and the u and v components of the wind are available at the 1000, 850, 700 and 500 mb levels. Primary emphasis is directed toward examining the seasonal variations in the fields. Large seasonal differences are found in the fields, most notably between winter and summer. Seasonal variations in the sign of the flux divergence are apparent in the latitude band 30 to 48 S. Convergence is more extensive during the winter, but the magnitudes of both divergence and convergence are greatest in summer. A seasonal asymmetry is also evident in the flux divergence field. Dissert. Abstr.

N85-18532*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RATIONALE AND SUGGESTED APPROACHES FOR RESEARCH GEOSYNCHRONOUS SATELLITE MEASUREMENTS FOR SEVERE STORM AND MESOSCALE INVESTIGATIONS
W. E. Shenk, R. F. Adler, D. Chesters, J. Susskind, and L. Uccellini
Jan. 1984 37 p refs
(NASA-TM-86185; NAS 1.15:86185) Avail: NTIS HC A03/MF A01 CSCL 04B

The measurements from current and planned geosynchronous satellites provide quantitative estimates of temperature and moisture profiles, surface temperature, wind, cloud properties, and precipitation. A number of significant observation characteristics remain, they include: (1) temperature and moisture profiles in cloudy areas; (2) high vertical profile resolution; (3) definitive precipitation area mapping and precipitation rate estimates on the convective cloud scale; (4) winds from low level cloud motions at night; (5) the determination of convective cloud structure; and (6) high resolution surface temperature determination. Four major new observing capabilities are proposed to overcome these deficiencies: a microwave sounder/imager, a high resolution visible and infrared imager, a high spectral resolution infrared sounder, and a total ozone mapper. It is suggested that the four sensors are flown together and used to support major mesoscale and short range forecasting field experiments. E.A.K.

N85-18533*# Utah Univ., Salt Lake City.
GLOBAL SCALE DIAGNOSES OF FGGE DATA Semiannual Report
Jan Paegle 7 Feb. 1985 6 p
(Grant NAG5-127)
(NASA-CR-174356; NAS 1.26:174356) Avail: NTIS HC A02/MF A01 CSCL 04B

Descriptive global scale diagnoses of the First Global Atmospheric Research Experiment SOP-1 analyses were made and compared against controlled, real data integrations of the Goddard Laboratory of Atmospheric Science (GLAS) general circulation model (GCM) as well as other data sets. The effects of critical latitudes were studied; the influence of tropical wind data and latent heating upon the GLAS GCM was diagnosed; planetary wave structure on various time scales from the diurnal to the monthly was studied; and the GLAS analyses were compared with other analyses. Short term controlled GLAS GCM integrations

show that: (1) the inclusion of tropical wind data in real data integrations has an important influence in the mid-latitude prediction in both hemispheres; and (2) the tropical divergent wind reacts almost immediately to alteration of the tropical latent heating. The presence or absence of zonally averaged easterlies depends strongly upon the presence of tropical latent heating. A.S.B.

N85-18534# Pennsylvania State Univ., University Park. Dept. of Meteorology.
THE INFLUENCE OF SOIL MOISTURE DISTRIBUTION ON THE SEVERE-STORM ENVIRONMENT OF THE SOUTHERN GREAT PLAINS: A NUMERICAL STUDY OF THE SESAME 4 CASE M.S. Thesis
May 1984 262 p refs Sponsored in part by NSF
(Grants AF-AFOSR-0125-79; AF-AFOSR-0064-83)
Avail: NTIS HC A12/MF A01

The influence that differences in ground moisture over the southern Great Plains and Mexican plateau exert on the formation and evolution of the dryline, the elevated mixed layer, the Mexican lee-side trough and the nocturnal low-level jet is examined. The elevated mixed layer, or lid, is especially important since it was a very prominent feature over the southern plains on 8-10 May 1979. Specifically, the role of surface sensible heating over Texas on the evolution of the dryline and lid, and over Mexico on the formation of the lid and lee-side trough is examined by means of a scenario in which dry and wet surface conditions over the southern plains and Mexico are simulated by a limited-area model which contains a multilevel planetary boundary layer parameterization as well as horizontally varying terrain elevation and surface parameters. The surface parameters include soil moisture availability, roughness length, soil thermal inertia, albedo, and infrared emissivity. A.R.H.

N85-18535# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DROUGHTS AND FLOODS IN SOUTH AMERICA DUE TO THE 1982-83 EL NINO-SOUTHERN OSCILLATION EPISODE
Carlos A. Nobre and Nilton deO. Renno Feb. 1985 5 p refs Prepared for presentation at the 16th Conf. on Hurricanes and Tropical Meteorol., Houston, Tex., May 1985
(INPE-3408-PRE/677) Avail: NTIS HC A02/MF A01

The 1982 to 83 El Nino/Southern Oscillation (ENSO) was one of the most intense ever recorded and it has affected the climate and weather in South America in several ways causing floods in many areas and droughts in others. Two aspects are concentrated on: (1) the abnormal dry period during January to February 1983 in central and northern Amazon and the severe drought over Northeast Brazil, from January through June, and (2) the extensive flooding in southern Brazil, northern Argentina and Paraguay in May to July 1983. Analysis of the 200 mb velocity potential charts from December 1982 to Feburary 1983 seems to indicate that the cause of that unusual dry spell was an anomalous Walker circulation. The extensive flooding in southern South America in May to July 1983 was caused primarily by excessive rainfall from a few quasi-stationary frontal systems. B.G.

N85-18536# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F ZWEIBRUCKEN AB, GERMANY Final Report
Aug. 1984 403 p Supersedes USAFETAC/DS-80/055 dated 19 Jul. 1979, AD-A087815
(AD-A147165; AD-E850748; USAFETAC/DS-84/028; USAFETAC/DS-80/055) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Zweibrucken AFB, Germany. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus visibility; sky cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N85-18537# Pacific Northwest Lab., Richland, Wash.
CONSIDERATION OF FUTURE CLIMATIC CHANGES IN THREE GEOLOGIC SETTINGS
G. M. Petrie Sep. 1984 73 p refs
(Contract DE-AC06-76RL-01830)
(DE85-001704; PNL-4937) Avail: NTIS HC A04/MF A01

Staff at Pacific Northwest Laboratory are evaluating the potential for climatic change to affect the integrity of a nuclear waste repository at: (1) the Gibson Dome area of Utah; (2) the Palo Duro Basin of Texas; and (3) the Gulf Coast. Because a major assumption in this analysis is that a glacial age will recur, the climate of the last glacial period is examined for each location. Combining these paleoclimatic data with the current climatic data, each location is evaluated in light of the criteria given in Draft Revised General Guidelines for Recommendation of Sites for Nuclear Waste Repositories (10 CFR 960). The results of this analysis suggest that sites located in these areas are likely to meet the climate requirements set forth in the guidelines. However, further study is needed before a definitive statement can be made. In particular, modeling the effect of sea level change on the Gulf Coast groundwater system and obtaining an improved estimation for the increase in recharge during glacier times at the Texas and Utah locations would be useful. Several strategies are presented for accomplishing this work. DOE

N85-18538# Pacific Northwest Lab., Richland, Wash.
MESOSCALE STORM AND DRY PERIOD PARAMETERS FROM HOURLY PRECIPITATION DATA: PROGRAM DOCUMENTATION
J. M. Thorp Sep. 1984 98 p refs
(Contract DE-AC06-76RL-01830)
(DE85-001366; PNL-5242) Avail: NTIS HC A05/MF A01

Data which can incorporated into theories and models that attempt to describe the complex relationship between precipitation occurrence and chemical wet deposition are presented. Computer programs were developed which incorporate hourly precipitation data from National Weather Service stations to calcuate mean values and frequency distributions of precipitation periods and of the interspersed dry periods. These programs were written with a degree of flexibility that allow user modification for applications to different, but similar, analyses. The rationale and operation of the two computer programs which produce the tables of average and frequency distributions of storm and dry period parameters from the precipitation data are described. DOE

N85-18539# Pacific Northwest Lab., Richland, Wash.
WEATHER DATA FOR SIMPLIFIED ENERGY CALCULATION METHODS. VOLUME 4: UNITED STATES, WYEC DATA
A. R. Olsen, S. Moreno, J. Deringer, and C. R. Watson Aug. 1984 263 p refs
(Contract DE-AC06-76RL-01830)
(DE85-000491; PNL-5143-Vol-4) Avail: NTIS HC A12/MF A01

The objective is to provide a source of weather data for direct use with a number of simplified energy calculation methods available today. Complete weather data for a number of cities in the United States are provided for use in the following methods: degree hour, modified degree hour, bin, modified bin, and variable degree day. Sets of weather data for 23 cities using Weather Year for Energy Calculations (WYEC) source weather data are given. The weather data at each city was summarized in a number of ways to provide differing levels of detail necessary for alternative simplified energy calculation methods. Weather variables summarized include dry bulb and wet bulb temperature, percent relative humidity, humidity ratio, wind speed, percent possible

sunshine, percent diffuse solar radiation, total solar radiation on horizontal and vertical surfaces, and solar heat gain through standard glass. Monthly and annual summaries, in some cases by time of day, are available. These summaries are produced in a series of nine computer generated tables. DOE

N85-18540# Pacific Northwest Lab., Richland, Wash.
WEATHER DATA FOR SIMPLIFIED ENERGY CALCULATION METHODS. VOLUME 3. WESTERN UNITED STATES: TRY DATA
A. R. Olsen, S. Moreno, J. Deringer, and C. R. Watson Aug. 1984 273 p refs 3 Vol.
(Contract DE-AC06-76RL-01830)
(DE85-000495; PNL-5143-Vol-3) Avail: NTIS HC A12/MF A01

A source of weather data for direct use with simplified energy calculation methods is presented. Complete weather data for a number of ities in the United States are provided for use in the following methods: degree hour, modified degree hour, bin, modified bin, and variable degree day. Sets of weather data for 24 cities in the continental United States using test reference year (TRY) source weather data are included. The weather data at each city are summarized in a number of ways to provide differing levels of detail necessary for alternative simplified energy calculation methods. Monthly and annual summaries are available. DOE

N85-18541# Pacific Northwest Lab., Richland, Wash.
WEATHER DATA FOR SIMPLIFIED ENERGY CALCULATION METHODS. VOLUME 1. EASTERN UNITED STATES: TRY DATA
A. R. Olsen, S. Moreno, J. Deringer, and C. R. Watson Aug. 1984 265 p refs 3 Vol.
(Contract DE-AC06-76RL-01830)
(DE85-000493; PNL-5143-Vol-1) Avail: NTIS HC A12/MF A01

A source of weather data for direct use with a number of simplified energy calculation methods available today is presented. Complete weather data for a number of cities in the United States are provided for use in the following methods: degree hour, modified degree hour, bin, modified bin, and variable degree day. Sets of weather data for 23 cities in the continental United States using test reference year (TRY) source weather data are given. The weather data at each city are summarized in a number of ways to provide differing levels of detail necessary for alternative simplified energy calculation methods. Weather variables summarized include: dry bulb and wet bulb temperature, percent relative humidity, humidity ratio, wind speed, percent possible sunshine, percent diffuse solar radiation, total solar radiation on horizontal and vertical surfaces, and solar heat gain through standard DSA glass. Monthly and annual summaries, in some case by time of day, are available. These summaries are produced in a series of nine computer generated tables. DOE

N85-18542# National Aerospace Lab., Amsterdam (Netherlands). Space and Informatics Div.
DISSEMINATION OF ERS-1 LOW BIT RATE DATA AND THE USE OF L-BAND RECEIVING STATIONS
H. A. vanIngenSchenau and G. J. L. Nooren 1984 75 p refs
(Contract NIVR-1978)
(NLR-TR-83049-U) Avail: NTIS HC A04/MF A01

The dissemination of ERS-1 real-time thematic products via the Global Telecommunication System (GTS) the ECS satellite system or the Euronet packet switching network is compared with use of direct-receive L-band stations as used for NOAA weather image reception. The L-band option has short delay time and global distribution, but local data only. In Western Europe GTS and the National Post Offices have sufficient capacity and often there is a satellite link with the ground station because of other Earth observation satellites. An advantage of the L-band option on a global scale is that it provides a back-up in the case of failure of the onboard recorder. Author (ESA)

N85-18543# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Numerische Modelle.
DATA CATALOG FOR THE 1982 DFVLR OBSERVATIONAL FOEHN EXPERIMENT
Klaus-Peter Honika, Hans Fimpel, Wolfgang Peters, and Hermann Willeke Sep. 1984 147 p refs
(DFVLR-FB-84-33; ISSN-0171-1342) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 50

Data obtained from airborne, rawinsonde, surface, and satellite observations of the Foehn winds in the Alps are presented. The observational program is described. Author (ESA)

N85-18544# Stockholm Univ. (Sweden). Dept. of Meteorology.
COMBINED EFFECTS OF BAROCLINIC AND BAROTROPIC INSTABILITY IN A NONLINEAR LOW ORDER MODEL
Olle Naabo Aug. 1984 63 p refs
(DM-41; ISSN-0349-0467) Avail: NTIS HC A04/MF A01

Instability of baroclinic Rossby waves superposed on a zonal flow is discussed. The motions resulting from this barotropic instability are characterized by large horizontal momentum transports and strong jet streams. By comparing results from a low-order nonlinear baroclinic model with the properties of a barotropic model it is found that the instability in the baroclinic model is due to a combination of vertical and horizontal wind shears, i.e., a combination of baroclinic and barotropic instabilities. The results are compared with diagnostics from high-frequency variations in areas of strong cyclonic activity. Author (ESA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-18545 Georgia Inst. of Tech., Atlanta.
A ONE DIMENSIONAL DYNAMICAL MODEL OF OCEAN/ATMOSPHERE INTERACTIONS PH.D. Thesis
James Kenny Fulford 1984 161 p
Avail: Univ. Microfilms Order No. DA8425184

In this study a model of air-sea interaction has been developed to study heat, mass, and momentum transfer between the ocean and the atmosphere. The model was a one dimensional, numerical, turbulent model which included the effects of thermal radiation transfer in the atmosphere, and the effects of absorption of solar radiation in both the ocean, and the atmosphere. Comparison with published data revealed that the model performed well in simulating temperature, velocity, and salinity profiles. The turbulent closure scheme used allowed calculation of transfer coefficients under different stability conditions in both the ocean and the atmosphere without adjustment of parameters. While the turbulent closure scheme required more calculations than does a simpler method of estimating turbulent diffusivities, the results suggest that the better physics involved in the scheme yield good results without adjusting constants for different conditions. Dissert. Abstr.

N85-18546 Wisconsin Univ., Madison.
THE WOBBLE OF THE EARTH AND THE LOW FREQUENCY DYNAMICS OF THE OCEAN Ph.D. Thesis
William Paul OConnor 1984 136 p
Avail: Univ. Microfilms Order No. DA8421943

The contribution to the excitation of the Earth's annual wobble due to wind stressed sea level is estimated. The oceans are assumed to be bounded by parallels of latitude and meridians of longitude. A vorticity equation is developed from the linear shallow fluid equations, with the curl of the wind stress as the forcing. This wind forced ocean circulation problem has a western boundary current solution and another solution valid over the larger ocean domain. The solution for the barotropic sea level is then obtained. The difference in wind stressed ocean set up between summer and winter contributes to the wobble excitation by its spatial distribution and time of maximum. Comparisons with the research of others show that this sea level excitation is of the phase and probable magnitude to significantly reduce the discrepancy between the astronomically inferred excitation and the

calculated geophysical excitations due to air mass redistribution, continental water storage, and mountain torque. Dissert. Abstr.

N85-18547# Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
A CRITICAL ANALYSIS OF OCEAN THERMAL ANALYSIS MODELS IN OPERATION AT FNOC (FLEET NUMERICAL OCEANOGRAPHY CENTERS) M.S. Thesis
Brian James Brady Sep. 1984 161 p
(AD-A148731; NPS68-84-015) Avail: NTIS HC A08/MF A01 CSCL 08/10

The objectives of this research are firstly to obtain a description of the characteristics of the ocean thermal structure from a portion of the ocean (ca.37 degs N to 39 deg N; 124 degs W to 126 deg W) sampled during the three cruises comprising OPTOMA5 which took place in June and July 1983. (OPTOMA - Ocean Prediction Through Observations, Modeling, and Analysis, is a joint Harvard/ NPS project intended to acquire field data to characterise synoptic scale eddies over a domain in the California Current off Northern California, and to set-up an eddy-resolving, statistical/dynamical, limited domain, open boundary numerical ocean prediction model. The '5' indicates the fifth series of cruises of the project). Secondly, the analysed ocean thermal structure is to be used as a sea truth by which to evaluate the accuracy of two real-time ocean thermal analysis systems presently in use at the Fleet Numerical Oceanography Center (FNOC), namely, the Expanded Ocean Thermal Structure (FCTS) analysis and the Thermodynamic Ocean Prediction System (TOPS)-Coupled EOTS (TEOTS) analysis. The final objective is to determine the operational significance of deviations in the modeled thermal structure from the sea truth by utilizing the output from operational acoustic models to provide a quantitative measure of the effect of these thermal structure differences on acoustic propagation in the ocean. Two low-frequency, passive-acoustic models were used to provide a measure of the variability of acoustic energy propagation which could be expected from the acoustic models alone. GRA

N85-18548# SRI International Corp., Menlo Park, Calif.
FIELD STUDIES OF RUN-UP GENERATED BY WIND WAVES ON DISSIPATIVE BEACHES Final Technical Report, Feb. 1980 - Mar. 1984
C. T. Carlson Mar. 1984 191 p
(AD-A148793) Avail: NTIS HC A09/MF A01 CSCL 08/3

Field measurements of incident waves and the resulting run-up made at two different natural sand beaches along San Francisco Bay show low-frequency energy in the run-up not observed in the corresponding incident-wave spectra. The experiments were conducted in December 1977 at Alameda Beach and in May 1982 at Coyote Point Beach. Both experiments were designed to measure the run-up on dissipative beaches exposed only to high-frequency, narrow-band wind waves at the exclusion of lower frequency swell. Criteria for field-site selection included a single breaker zone located near the shoreline with incident wind waves that broke by plunging, thereby minimizing reflection and forming a low-energy dissipative beach system. Elimination of the long-wave components in the incident wave field would suppress reflection at the shoreline, minimizing external nonlinear modulation of the run-up by edge waves and standing waves. Amplitude time series measurements of offshore incident waves and the run-up on the beach face were made simultaneously at multiple locations on the beach using 16-mm photography. Coherence analyses indicate that the offshore incident waves and run-up on the beach are not linearly correlated. Correlation analyses conducted on the run-up at alongshore distances up to 3.5 m indicate that the run-up is coherent in the alongshore direction up to this distance. GRA

N85-18549# Woods Hole Oceanographic Institution, Mass.
SLOPE WATER INTRUSIONS WITHIN THE NEARSHORE WATERS OFF LONG ISLAND, NEW YORK
J. H. Churchill Apr. 1984 65 p refs
(Contract DE-AC02-79EV-10005)
(DE85-001386; DOE/EV-10005-84/15; WHOI-84-15) Avail: NTIS HC A04/MF A01

From 1974 through 1978 intensive measurements were made of the salinity, temperature and current structure of the waters within 12 km of the Southern Long Island coastline. The data were derived from two sources: a mooring array from which time series of temperature, salinity and water velocity were measured at four depths at each of four offshore distances; and high resolution, daily STD and current meter surveys. During August and September intrusions of slope or outer shelf water were often observed by the STD surveys. Three intrusions have been studied in detail. Two were observed at mid-depth following periods of upwelling favorable winds. Concurrent hydrographic and current meter data suggest that these water masses were transported shoreward by a combination of wind forcing and longshore density gradients. The third intrusion, initially observed near the surface, had coinciding salinity and temperature maxima. This water mass appears to have entered the shelf as a result of a shelf/slope water exchange, possibly induced by a warm-core ring near the shelf break. Such intrusions may commonly occur during the summer and fall and may be related to the appearance of tropical fish in the Long Island vicinity during these seasons. DOE

N85-18550# Woods Hole Oceanographic Institution, Mass.
ANALYSIS OF FLOW WITHIN THE COASTAL BOUNDARY LAYER OFF LONG ISLAND, NEW YORK
J. H. Churchill Apr. 1984 75 p refs
(Contract DE-AC02-79EV-10005)
(DE85-001384; DOE/EV-10005-84/14; WHOI-84-14) Avail: NTIS HC A04/MF A01

From 1974 through 1978 a series of intensive measurements were made in the coastal waters within 12 km of Long Island. The data were derived from two sources: a mooring array from which time series of temperature, salinity and water velocity were measured at four depths at each of four offshore distances; and high resolution, daily hydrographic surveys. Analysis of subtidal cross-shore velocity fluctuations indicated a two-layer response to wind forcing, with near-surface flow to the right of the longshore wind and opposing flow below. The magnitude of these fluctuations increased in the seaward direction on a scale nearly equal to the internal deformation radius. The phase between longshore velocity fluctuations and longshore wind stress approached zero with decreasing bottom depth, probably the result of bottom stress. The vertical structure of longshore fluctuations during stratified conditions markedly differed from that during unstratified conditions, and resembled the structure derived from a simple two-layer coastal flow model. DOE

N85-18551# Institute of Oceanographic Sciences, Wormley (England).
MEASUREMENTS OF SEDIMENT TEMPERATURES, CONDUCTIVITY AND HEAT FLOW IN THE NORTH ATLANTIC AND THEIR RELEVANCE TO RADIOACTIVE WASTE DISPOSAL
M. J. Noel 25 Jan. 1984 95 p refs Sponsored by UK Department of the Environment
(IOS-172; DoE/RW-84.019; DGR-481/177) Avail: NTIS HC A05/MF A01

Methods used to measure sediment temperatures, conductivity and heat flow at 10 stations in the northeast Atlantic are described. Data from 53 individual penetrations were obtained. Surface heat fluxes are compared to the values predicted by crustal cooling models while sediment temperature profiles are examined for evidence of vertical pore water advection. No thermal evidence for advection through sediments in the Great Meteor East study area is found. However, nonlinear temperature profiles may be evidence for rapid pore water advection in the King's Trough Flank study region. Author (ESA)

N85-18552# Institute of Oceanographic Sciences, Wormley (England).
BENTHIC BOUNDARY LAYER, IOS OBSERVATIONAL PROGRAMME: DISCOVERY GAP MEASUREMENTS, MARCH 1984
P. M. Saunders 17 Apr. 1984 46 p refs Sponsored by UK Department of the Environment
(ISO-180; DoE/RW/84-052; DGR-481/176) Avail: NTIS

HC A03/MF A01

A narrow gap in the East Azores Fracture Zone which provides a channel for the exchange of the bottom water between the Madeira and Iberian abyssal basins (Discovery Gap) was surveyed. A persistent S-N flow is found and a flux of water colder than 2.05 C (potential temperature) is estimated. This discharge spreads over a region beyond the Gap exit where it is warmed by geothermal heating from the seabed and by mixing with the overlying warm water. The estimated through density surface diffusion is 2 sqcm/sec, similar to values determined from much larger channels in the Western Atlantic. It is not known if most of the mixing takes place near the sea bed. The values are in striking contrast to those derived for diffusion along a density surface: in Discovery Gap values are estimated to be 5 million sqcm/sec. Author (ESA)

N85-18553# Institute of Oceanographic Sciences, Wormley (England).

THE USE OF IN-SITU PHOTOGRAPHY IN STUDIES OF THE DEEP-SEA BENTHOS AT IOS

R. S. Lampitt, A. L. Rice, and M. H. Thurston 13 Jan. 1984 41 p refs Sponsored by UK Dept. of Energy
(IOS-182; DoE-RW/84.006; DGR-481/178) Avail: NTIS HC A03/MF A01

Transect and time lapse underwater photography is discussed. Transect photographs are of limited use alone, but their value is greatly enhanced with results obtained from other techniques. Time-lapse photography alone may provide information which is not obtainable by other means, though the value of this technique also becomes much greater when it is used with other means. The combination of techniques provides important data on the structure and abundance of deep-sea communities, on the behavior of constituent species, and on the rates of fundamental biological processes. Author (ESA)

N85-18554# Institute of Oceanographic Sciences, Wormley (England).

AN ASSESSEMENT OF BIOLOGICAL PROCESSES CLOSE TO THE SEA BED IN A SLOPE REGION AND ITS SIGNIFICANCE TO THE ASSESSMENT OF SEA-BED DISPOSAL OF RADIOACTIVE WASTE

P. M. Hargreaves, C. J. Ellis, and M. V. Angel 29 Aug. 1984 123 p refs Sponsored by UK Dept. of Energy
(IOS-185; DoE/RW/83-132; DGR-481/178) Avail: NTIS HC A06/MF A01

Vertical profiles of planktonic and micronektónic biomass were observed close to the sea bed along a transect running up the continental slope on the southern flank of the Porcupine Seabight (to the southwest of Ireland). Biomass concentration doubles from 100 to 10m above the sea bed. This is singificant for disposal of high level radioactive waste since biological activity increases close to the sea bed; slope regions are areas where the potential for vertical transport of material by biological processes is enhanced; there may be dynamic links across slopes between deep-living communities and the shelf communities which are heavily exploited for living resources; so any isotopes transported by physical processes from a dumpsite which impinge on the slope may become incorporated into a highly dynamic system. It is unclear whether the dominant flux would be up slope or back onto and into the sediment. Author (ESA)

N85-18555# National Academy of Sciences - National Research Council, Washington, D. C.

DEEP SEABED STABLE REFERENCE AREAS Final Report

Jun. 1984 85 p refs
(Contract NA82RA-C-00049)
(PB84-241470) Avail: NTIS HC A05/MF A01 CSCL 08G

Section 109(f) of the Deep Seabed Hard Minerals Resources Act of 1980 (P.L. 96-283) requires the Secretary of State, in cooperation with the administrator of the NOAA to negotiate the establishment of international stable reference areas (SRAs) where no mining of the deep seabed will occur. The SRAs are to be used as a reference zone or zones for purposes of resource evaluation and environmental assessment of deep seabed mining, and include the designation of appropriate zones to insure a representive and stable biota of the deep seabed. The following are contained: findings and recommendations, introduction, including background, legislation, mining program and international developments, preservational reference areas, impact reference areas, and implementation. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-18556# Mount Sinai School of Medicine, N. Y. Dept. of Biochemistry.

RESPIRATORY CHAIN OF ALKALOPHILIC BACTERIA Annual Progress Report, 1 Jul. 1983 - 30 Apr. 1984

Terry Ann Krulwich 1984 5 p refs
(Contract DE-AC02-81ER-10871)
(DE84-012558; DOE/ER-10871/T1) Avail: NTIS HC A02/MF A01

The respiratory chain of alkalophilic bacteria was studied and it is indicated that these organisms possess specific adaptations to meet the unusual energy demands of life at high pH. Respiratory chain components were studied. The cytochrome oxidase from Bacillus firmus RAB was purified and characterized. Proton pumping studies by reconstituted preparations were started. The interesting problem of the regulation of cytochrome levels in the alkalophiles was examined via pH shift experiments and via a new hypothetical framework which may generate an experimental approach to the mechanism whereby nonalkalophilic mutants have greatly reduced cytochrome levels. DOE

N85-18557# Columbia Univ., New York. Radiological Research Lab.

RADIATION PHYSICS, BIOPHYSICS, AND RADIATION BIOLOGY Progress Report, 1 Dec. 1983 - 30 Nov. 1984

H. H. Rossi and E. J. Hall Jul. 1984 410 p refs
(Contract DE-AC02-83ER-60142)
(DE84-014885; DOE/ER-60142/2) Avail: NTIS HC A18/MF A01

Research progress is reported in the areas of radiation physics, biophysics, and radiation biology. Topics discussed include: general physics, dosimetry, microdosimetry, cell survival after irradiation, radiochemistry, and cell biology. DOE

N85-18558# European Space Agency, Paris (France).

GRAVITY AND BIOLOGICAL SYSTEMS: EMPHASIS ON HUMAN PHYSIOLOGY

Helmut Hinghofer-Szalkay (Technical Univ., Graz) Oct. 1984 27 p refs Original contains color illustrations
(Contract ESA-83/66)
(ESA-BR-21; ISSN-0250-1589) Avail: NTIS HC A03/MF A01

Gravitational effects on human visual, vestibular, and kinesthetic judgments; muscles, bones, and joints; cardiovascular system under varying g-stress; blood, and other body fluids; and regulatory systems are discussed. Micro-g simulations, and their limitations; and real weightlessness are considered. Potential ESA human physiology life sciences programs including the Anthrorack concept are outlined. Author (ESA)

N85-18559# Joint Publications Research Service, Arlington, Va.

USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES

23 Jan. 1985 178 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-002) Avail: NTIS HC A09/MF A01

Progess in research and development in the areas of life sciences, biomedical, and behavioral sciences are reported. Topics discussed include: aerospace medicine, agrotechnology, biochemistry, environmental sciences, epidemiology, food technology, genetics, human factors engineering, immunology, laser application and effects, microbiology, nonionizing and electromagnetic radiation effects, pharmacology and toxicology, physotology, public health,

psychology, veterinary medicine, and virology. For individual titles, see N85-18560 through N85-18565.

N85-18560# Joint Publications Research Service, Arlington, Va.
GROWTH OF SOIL BACTERIA IN PRESENCE OF MARTIAN SOIL ANALOG, CARBON DIOXIDE AND HYDROGEN PEROXIDE Abstract Only
A. A. Imshenetskiy, B. G. Murzakov, M. D. Yevdokimova, and I. K. Dorofeyeva *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-002) 23 Jan. 1985 p 1 Transl. into ENGLISH from Mikrobiol. (Moscow), v. 53, no. 4, Jul. - Aug. 1984 p 605-608 (For primary document see N85-18559 09-51)
Avail: NTIS HC A09/MF A01

The composition of soil bacterial communities growing in mixture of minerals modeling Martian soil in the presence of carbon dioxide gas and hydrogen peroxide were analyzed. After cultivation of experimental specimens, bacteria were grown in a meat peptone broth in a thermostat at 28 deg C under ordinary laboratory conditions and at 28 deg C in aerostats filled with carbon dioxide. A significant decreases in the number of bacteria upon cultivation under aerobic conditions and in the aerostats in comparison to the initial quantity, in the presence of the soil analog, and in soil specimens without addition of the analog are shown. It is found that a very high content of carbon dioxide and the presence of a mixture of minerals may include the existence of microorganisms. It is emphasized that spore forming microorganisms under these conditions have higher sensitivity to unfavorable factors in the environment, and their vegetative growth occurs intensively when the conditions become favorable. E.A.K.

N85-18561# Joint Publications Research Service, Arlington, Va.
ROLE OF ENGINEERING PSYCHOLOGY c53
A. Savayan *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-002) 23 Jan. 1985 p 26-30 Transl. into ENGLISH from Trud (Moscow), 18 Sep. 1984 p 3 (For primary document see N85-18559 09-51)
Avail: NTIS HC A09/MF A01

Human factors engineering in the working force is discussed. The psychological effects of automation and robotics are analyzed. The contribution of human factors to work accidents and lost work hours is outlined. Psychological fitness of equipment operators for the appropriate jobs is outlined. E.A.K.

N85-18562# Joint Publications Research Service, Arlington, Va.
EFFECT OF MODULATED ULTRAHIGH FREQUENCY FIELD ON BEHAVIOR AND HORMONE LEVEL IN FEMALE RATS UNDER EMOTIONAL STRESS Abstract Only
M. M. Rasulov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-002) 23 Jan. 1985 p 123 Transl. into ENGLISH from Patologicheskaya Fiz. i Eksperim. Terapiya (Moscow), no. 3, May - Jun. 1984 p 13-16 Original language document was announced in IAA as A84-41391 (For primary document see N85-18559 09-51)
Avail: NTIS HC A09/MF A01

The effect of a modulated electromagnetic field (MEMF) on behavior and sexual hormones level of, determined from the length of the estrous cycle and of its separate phases, was studied in female Wistar rats subjecteed to sexual deprivation. The ratio of frequency of running to number of vertical positions (R:V) was used as an index. The relative significance of sexual behavior more than doubled in comparison with the initial level. The existence of individual differences in sensitivity to a UHF field is confirmed. The data on the estrous cycle indicate the tranquilizing effect of a UHF field on the neuroendocrine system and the greater resistance of individual animals exposed to MEMF to the development of sexual neurosis. E.A.K.

N85-18563# Joint Publications Research Service, Arlington, Va.
METHODICAL APPROACHES TO DETERMINATION OF SANITATION PROTECTIVE ZONE DIMENSIONS AROUND TV CENTERS AND TV RETRANSMITTERS Abstract Only c52
Yu. D. Dumanskiy, D. S. Ivanov, I. I. Karachev, S. V. Bitkin, and V. M. Pavlova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-002) 23 Jan. 1985 p 124 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 8, Aug. 1984 p 62-65 (For primary document see N85-18559 09-51)
Avail: NTIS HC A09/MF A01

With the increase of the number of TV stations and TV retransmitters, the potential danger to the population from exposure to meter and decimeter long electromagnetic waves increases too. It is important to analyze each individual station and to develop a volume and space sanitation protective zone (SPZ) for each station. The SPZ is the area around the emission source at the border of which the electromagnetic field (EMF) is at the maximum permissible level. Determination of the radius of such SPZ from the equipment used at TV stations is a complex problem. A simplified method was developed consisting of four steps: (1) calculation of field intensity for a typical center; (2) plotting the distance intensity functional curves; (3) plotting the distribution curves for SPZ radii as a function of height; and (4) actual determination of SPZ area around the TV station by sanitary engineer specialists. This approach creates an atlas of curves for various TV stations which characterize the relationships between field intensity and the distance from EMF source. E.A.K.

N85-18564# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL AND STRUCTURAL CHANGES IN HUMAN ERYTHROCYTE SURFACE AFTER IRRADIATION BY UV WAVES OF VARIOUS WAVELENGTHS. REPORT 1: EXPRESSION OF ABO AND RHESUS SYSTEM ANTIGEN Abstract Only
K. A. Samoylova, K. N. Klimova, L. S. Priyezzheva, and R. A. Artsishevskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-002) 23 Jan. 1985 p 124-125 Transl. into ENGLISH from Tsitologiya (Leningrad), v. 25, no. 12, Dec. 1983 p 1378-1386 (For primary document see N85-18559 09-51)
Avail: NTIS HC A09/MF A01

The effect of shortwave ultraviolet (SUV) radiation ad causes change in the external surface of human erythrocytes, modifying the expression of the ABO and Rh system antigens which are related to the surface of the cells was investigated. Erythrocytes in a structurally prepared erythrocyte mass from 23 donors stabilized by glugicir or heparin were examined. Three series of experiments were performed: (1) isolated erythrocytes, before irradiation thrice washed to remove plasma with isotonic NaC1 0.9%, erythrocytes diluted to 5 x s10 to the 7th power cells per milliliter; and erythrocytes on the undiluted erythrocyte mass about 7 x 5 x 109 to the 9th power cells power milliliter. The agglutinating activity of the ABO and Rh antigens was studied. Two to three hours after exposure to 248, 620, 1240 and 2480 J/m2, the degree of hemolysis of isolated erythrocytes increased by 5,10,18 and 28%. Changes were also observed in agglutinating activity of ABO antigens. The agglutinating activity of A and B antigens increased by an average factor of 2 minus H antigens by a factor of 4. The SUV radiation did not cause any activation of the Rh antigen. E.A.K.

N85-18565# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL AND STRUCTURAL CHANGES IN HUMAN ERYTHROCYTE SURFACE AFTER IRRADIATION BY UV WAVES OF VARIOUS WAVELENTGHTS. REPORT 2: ADSORPTION OF ALCYAN BLUE BY EXTERNAL PREMEMBRANOUS COMPONENTS Abstract Only
R. A. Artsishevskaya and K. A. Samoylova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-002) 23 Jan. 1985 p 125 Transl. into ENGLISH from Tsitologiya (Leningrad), v. 25, no. 12, Dec. 1983 p 1387-1392 (For primary document see N85-18559 09-51)
Avail: NTIS HC A09/MF A01

A method to quantitatively determine the external premembranous layers of cells was used to determine the extent to which shortwave ultraviolet (SUV) radiation influences the status of this structure in human erythrocytes. Manifestation of external premembranous layers in nonirradiated and irradiated erythrocytes was judged by the adsorption of a cationic phthalocyanine dye. Optimal staining conditions were found: concentration of cell suspension

10 to the 8th power cells/ml, concentration of dye solution 0.005%, staining time 10 minutes. The influence of SUV on adsorption of erythrocytes results in a reliable decrease in dye sorption. Small and medium doses cause a reduction in sorption, while the highest dose used, 3720 j/m2, causes an increase of 19.5% in dye sorption, sometimes up to 40 to 50%. It is assumed structural perturbation of the erythrocyte surface may cause activation not only of ABO and Rh antigens, but also other antigens, and changes in a number of properties and functions of the cells which involve specialized cell surface systems such as receptors and enzyme groups. E.A.K.

N85-18566# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
6 Feb. 1985 245 p refs Transl. into ENGLISH of various Russian articles
(JPRS-UBB-85-007) Avail: NTIS HC A11

Various topics in the life sciences are addressed, including agrotechnology, biochemistry, biophysics, biotechnology, ecology, and epidemiology. In addition, food technology, genetics, immunology, laser effects, medicine, microbiology, molecular biology, toxicology, physiology, public health, and radiation biology are considered. For individual titles, see N85-18567 through N85-18571.

N85-18567# Joint Publications Research Service, Arlington, Va.
WORK CAPACITY OF HEAT AND ELECTRIC POWER PLANT OPERATIONS WORKING 12 HOUR DAY AND NIGHT SHIFTS Abstract Only c54
A. O. Navakatikyan, V. V. Kalnish, and V. B. Lastovchenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 63 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 3, Mar. 1984, p 88-89 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

Various parameters of the CNS and cardiovascular system were analyzed in relation to work performance of 20 individuals employed 12 h day and night shifts at a heat and electric power plant. The subjects under study consisted of engineers and supervisors responsible for control and managing functions requiring a high rate of information processing. The results indicate that both daytime and nightime shifts involved compensatory changes in the CNS and the cardiovascular systems. Cardiovascular stress was much more profound during the day shift, while CNS stress predominated during the night shift. These observations indicate inter-system interactions directed to favor the greater emphasis placed on the CNS at night to maintain wakefulness and alertness. Author

N85-18568# Joint Publications Research Service, Arlington, Va.
SUCCESS IN LEARNING OCCUPATION OF CHEMICAL PRODUCTION TECHNICIAN AS FUNCTION OF CERTAIN PERSONALITY TRAITS AND DEVELOPMENT OF PSYCHOPHYSIOLOGICAL FUNCTIONS Abstract Only c54
N. D. Bobrishcheva-Pushkina *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 63-64 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 7, Jul. 1984 p 22-26 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

The influence of certain personality traits and the level of psychophysiological functions were studied with respect to the success of students in learning the occupation of chemical technician during studies and independent work. Forty-eight training school students, 17 to 19 years of age, were observed. Success was judged by questioning teachers and superiors on the job. The students' performance was measured over a period of 1 year. It was found that successful mastery of this occupation was combined with a low level of extroversion, neuroticism and alarm, well developed visual and operational memory, the ability to read the scales of instruments rapidly, deductive thinking, good concentration, and distribution and switching of attention. Persons who were easily alarmed did not master the occupational skills and abilities of the technician well and became easily fatigued during independent work. These skills and abilities can be used as prognostic tools in selecting personnel for training and employment as chemical technicians. Author

N85-18569# Joint Publications Research Service, Arlington, Va.
STUDY OF BODILY FUNCTIONAL STATUS AND QUALITY OF CONTROLLING ACTION OF POWER UNIT OPERATORS WITH VARIOUS INTENSITIES OF LABOR Abstract Only c54
Yu. P. Paltsev, A. V. Koslesnikova, L. I. Lipkina, and D. K. Fedotov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 64 Transl. into ENGLISH from Gigiyene Tr. i Prof. Zabolevaniya (Moscow), no. 8, Aug. 1984 p 37-42 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

Power unit operator's working conditions were studied. Results show that climate and light levels corresponded to the hygienic standards. Sound levels were 7 to 9 dB above the standards at 250 to 8000 Hz. Bodily functional status, operational loads, and quality of control actions under normal working conditions were determined. Eight operators 27 to 36 years of age with at least one year in service at their occupation were studied. It was found that the need to concentrate attention and the high degree of responsibility, coupled with the monotonous nature of the work and insufficient physical activity, could decrease functional activity of the central nervous system and cause stress on the autonomic system. The negative influence of sensory monotony and hypokinesia should be reduced by increasing the number of active actions and motor loading on the body of the operators. R.S.F.

N85-18570# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF PSYCHOLOGICAL SUPPORT OF AUTOMATED ORGANIZATION CONTROL SYSTEMS Abstract Only c53
B. S. Berezkin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 65 Transl. into ENGLISH from Psikhologicheskiy Zh. (Moscow), v. 5, no. 4, Jul. - Aug. 1984 p 74-82 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

Simple mathematical equations are developed to relate the quantity of information assinilated to the basic quantities characterizing the process of input and storage of information in memory. This allows the development of quantitative values for the major variables measured in experiments and comparison of calculated quantities with known experimental results, and also allows a prediction to be made of the relative behavior of a given process related to the functioning of memory. The mathematical equations presented can be used to determine quantitatively the information contained in human memory as a function of the characteristics of the process of input and storage of information. Checking of the mathematical model using experimental data known from the literature has shown its good agreement with experimental data, allowing it to be recommended for practical use. Author

N85-18571# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF PSYCHOLOGICAL SUPPORT OF AUTOMATED ORGANIZATION CONTROL SYSTEMS Abstract Only c53
B. S. Berezkin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 65-66 Transl. into ENGLISH from Psikhologicheskiy Zh. (Moscow), v. 5, no. 4, Jul. - Aug. 1984 p 74-82 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

Hopes for improving the quality of administration by introducing automated systems have not been fully realized, primarily because the automation equipment has yet to become a true assistant to administrators at all levels. Automation is hardly used where it might be most effective, in decision support systems at high administrative levels. Many systems now in operation have underestimated the significance of man in modern administrative systems. The problems of psychological support of automatic organizational control systems can be defined as support of inter-organizational interactions as well as internal problems or organization of users, developers, and administrative system

personnel. Tasks include increasing the convenience of interaction of users with automation equipment, supporting training of users for interaction with automatic equipment, and assuring psychological safety for users as they work with automation equipment. Problems include the creation of the necessary psychological tool kit and development of new forms of interaction among academic, research, and development institutions. Author

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-18572 Michigan State Univ., East Lansing.
SCATTERING OF ELECTROMAGNETIC WAVES BY HUMAN BODY AND ITS APPLICATIONS Ph.D. Thesis
Devendra K. Misra 1984 206 p
Avail: Univ. Microfilms Order No. DA8424455

The scattering of electromagnetic waves by the human body was studied. The presence of three orthogonally aligned E-field probes, near a cylindrical model of human body illuminated ty Te and TM waves, were determined theoretically. Theoretical results of the probe responses were verified experimentally using a cylindrical dielectric shell filled with saline solution. The expressions for the backscattered electric fields from a cylindrical and a spherical body illuminated by plane EM waves were obtained and their behaviors were studied when the body-radius changes with time. It is observed that the phase of the return signal changes approximately linearly with changes in the radius, while the magnitude of this signal is not linearly affected. Two different techniques for detecting the breathing and heart beats of humans from large distances are presented. Detection of the breathing and heart beats from about 100 feet and also through a concrete wall is reported. Dissert. Abstr.

N85-18573 Uniformed Services Univ. of the Health Sciences, Bethesda, Md.
BLOOD VISCOSITY RESPONSES TO ACUTE EXERCISE AND AEROBIC CONDITIONING IN WOMEN Ph.D. Thesis
Dale Glen Martin 1984 143 p
Avail: Univ. Microfilms Order No. DA8426730

Aerobic capacity is limited by the amount of oxygen delivered to the working muscles and the rate of utilization of oxygen at the tissue level. At a given arterial oxygen content the amount of oxygen delivered is a function of blood flow. Blood flow is in turn dependent upon vascular hindrance and blood viscosity. To assess whether aerobic conditioning might alter oxygen transport through changes in blood viscosity, several components of blood viscosity were measured in healthy women. Forty-seven women (fifteen sedentary women, 14 joggers who ran 5-15 miles per week and 18 marathoners who ran more than 50 miles per week) were evaluated. When evaluated by maximum exercise tolerance on the Bruce protocol, they had clearly different maximal aerobic capacities, 34.1 + or - 5.5, 44.8 + or - 4.4 and 51.0 + or 5.2 ml kg-1 min-1, respectively, for the sedentary group, joggers and marathoners. Conditioning levels and aerobic capacities did not correlate with resting, exercise or recovery whole blood viscosity or its components. Whole blood viscosity increased with exercise in all subjects. Dissert. Abstr.

N85-18574# Naval Health Research Center, San Diego, Calif. Environmental Medicine Dept.
MORBIDITY AND MORTALITY ASSOCIATED WITH EXPOSURE TO OTTO FUEL II IN THE U.S. NAVY 1966-1979 Interim Report
James C. Helmkamp, Samuel A. Forman (Naval Environmental Health Center, Norfolk, Va.), Michael S. McNally, and Craig M. Bone Aug. 1984 24 p
(AD-A148726; NAVHLTHRSCHC-84-35) Avail: NTIS HC A02/MF A01 CSCL 06/5

This investigation assessed whether the morbidity and mortality previously associated with nitrated esters would be found in Torpedoman's Mates (TM) potentially exposed to Otto Fuel II. In the initial analysis, illness and/or death in 16 selected cardiovascular, neurologic, and toxic diagnoses were compared among potentially exposed TMs (and appropriate control groups) during the period 1966-1979. Hospitalization rates and confidence intervals were calculated and survival tables were used to calculate the probability of hospitalization. Estimates of age and occupational group-specific relative risks were then made to determine if there were any significant risk differences between study groups. There was no statistically significant excess of CVS morbidity or mortality in TMs. Lack of reliable PNEC information prior to 1970 may have introduced a selection bias that obscured the true Otto Fuel exposure experience of TMs. Additionally, the wide spectrum of disease conditions that may be associated with the use of Otto Fuel have known non-occupational risk factors and etiologies that could be confounding factors. To overcome these biases, a second analysis focused on three CVS (Cardiovascular System), conditions (acute myocardial infarction, angina pectoris and cardiac arryhthmias), known to be associated with analogous nitrated esters. Risk assessment analysis for the ten-year period (1970-1979) suggests that exposed TMs have a significantly greater risk of a CVS related hospitalization compared to other TMs and fire control technicians. GRA

N85-18575# New Jersey Medical School, Newark.
THE PHYSIOLOGY OF ULTRADIAN RHYTHMS AND THEIR ROLE IN AFFECTING DISEASE RESISTANCE Final Report, 15 Mar. 1981 - 30 Sep. 1983
B. H. Natelson and W. N. Tapp 1 Oct. 1983 40 p
(Contract DAMD17-80-C-0166; DA Proj. 3E1-62777-A-879)
(AD-A148842) Avail: NTIS HC A03/MF A01 CSCL 06/5

United States military combat personnel will not always be able to maintain normal 24 hr schedules of work and rest. Our laboratory has been studying in what ways biological rhythms interact with some non-standard light-dark schedules to affect how well an animal functions and how susceptible it is to disease. Contrary to what might be expected, we have found that a number of non-24 hr schedules actually protect rodents from both stress-induced and spontaneously occurring diseases. This phenomenon, which we call chronotherapy, may eventually be used to reduce the incidence of disease in stressful situations where the length of the light-dark schedule can be controlled, such as in spacecraft. We hypothesize that these non-standard light-dark schedules enhance disease resistance by changing the relationships between various behavioral and physiological rhythms. To examine the relationships between rhythms in animals on non-24 hr schedules, we have developed a system which concurrently monitors behavior (motor activity; performance on a vigilance-choice task, feeding) and physiological processes (plasma cortisol; core temperature) in non-human primates. GRA

N85-18576# Oak Ridge National Lab., Tenn.
APPROACHES TO RADIATION GUIDELINES FOR SPACE TRAVEL
R. J. M. Fry 1984 25 p refs Presented at 25th Plenary Sess. of COSPAR, Graz, Austria, 25 Jun. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001248; CONF-8406167-5) Avail: NTIS HC A02/MF A01

There are obvious risks in space travel that have loomed larger than any risk from radiation. Nevertheless, NASA maintained a radiation program that involved maintenance of records of radiation exposure, and planning so that the astronauts' exposures are kept as low as possible, and not just within the current guidelines. These guidelines are being reexamined currently because new information is available, for example, risk estimates for radiation-induced cancer and about the effects of HZE particles. Furthermore, no estimates of risk or recommendations were made for women in 1970 and must now be considered. The current career limit is 400 rem. The appropriateness of this limit and its basis are being examined as well as the limits for specific organs. There is now considerably more information about age-dependency for radiation and this will be taken into account. Work is being carried out on

the so-called microlesions caused by HZE particles and on the relative carcinogenic effect of heavy ions, including iron. A remaining question is whether the fluence of HZE particles could reach levels of concern in missions under consideration. DOE

N85-18577# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
HYDROGEN-OXYGEN (HYDROX) BREATHING AT 1.3MPa
Hans Oernhagen Oct. 1983 104 p refs
(FOA-C-58015-H1; ISSN-0347-7665) Avail: NTIS HC A06/MF A01

During a heliox saturation to 1.3 MPa (13 atm) three divers were exposed to mask of hydrox (hydrogen-oxygen 98/2) for periods up to 60 min. Depth narcosis, pulmonary mechanics, physical work capacity, isobaric gas supersaturation, and blood chemistry were studied. Hydrogen handling is described. No harmful effect of hydrogen as such is found. Hydrogen gives better respiration than helium. Hydrogen however has such a narcotic potency that it is probably not possible to use it at greater partial pressures than 2.0 MPa or 200 m. Author (ESA)

N85-17988# Naval Training Equipment Center, Orlando, Fla.
SIMULATOR SICKNESS: SENSORIMOTOR DISTURBANCES INDUCED IN FLIGHT SIMULATORS
L. H. Frank, R. S. Kennedy, M. E. McCauley, R. W. Root, and R. S. Kellogg *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 417-426 (For primary document see N85-17962 09-01)
(AD-P004334) Avail: NTIS HC A22/MF A01 CSCL 06/19

N85-18563# Joint Publications Research Service, Arlington, Va.
METHODICAL APPROACHES TO DETERMINATION OF SANITATION PROTECTIVE ZONE DIMENSIONS AROUND TV CENTERS AND TV RETRANSMITTERS Abstract Only
Yu. D. Dumanskiy, D. S. Ivanov, I. I. Karachev, S. V. Bitkin, and V. M. Pavlova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-002) 23 Jan. 1985 p 124 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 8, Aug. 1984 p 62-65 (For primary document see N85-18559 09-51)
Avail: NTIS HC A09/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-18578# EEG Systems Lab., San Francisco, Calif.
NEUROCOGNITIVE PATTERN ANALYSIS OF AN AUDITORY AND VISUAL NUMERIC MOTOR CONTROL TASK. PART 1: DEVELOPMENT OF METHODS Final Report, 22 Feb. 1982 - 30 Sep. 1984
A. S. Gevins, S. L. Bressler, B. A. Cutillo, J. C. Doyle, and N. H. Morgan Oct. 1984 96 p
(Contract F49620-82-K-0006)
(AD-A148809; AFOSR-84-1107TR) Avail: NTIS HC A05/MF A01 CSCL 05/10

New advances in understanding human neurocognitive functions must come from new technologies for measuring split-second changes in event related electrical and magnetic fields which may soon complement the anatomical information produced by CT and NMR brain scans and the static metabolic images of PET scans. As a contribution to this effort, the EEGSL is developing the method of Neurocognitive Pattern (NCP) Analysis to study both simple and complex cognitive tasks. A number of previous findings suggest that neither strictly localizationist (single equivalent dipole) nor equipotentialist (hologram) models of neurocognitive processing are realistic. Rather, a more appropriate model seems to be a distributed computational network in which there is continuous communication between many parallel, specialized processing elements. In order to better measure and model these complex processes, the initial thirty months of this project focused on developing experimental tasks and advanced recording and analysis technologies. GRA

N85-18010*# Seville Training Systems Corp., Pensacola, Fla.
FLIGHT CREW TRAINING TECHNOLOGY: A REVIEW
Paul W. Caro *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 9-39 refs (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18011*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LOW-COST TRAINING TECHNOLOGY
Alfred T. Lee *In its* Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 41-55 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18012*# USAir, Pittsburgh, Pa.
CAPTAIN DEVELOPMENT TRAINING AT US AIR
Stan Fickes *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 57-77 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18013*# Piedmont Aviation, Inc., Winston-Salem, N. C.
MANAGEMENT TRAINING FOR COCKPIT CREWS AT PIEDMONT FLIGHT
J. C. Sifford *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 79-101 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18014*# United Air Lines, Inc., Chicago, Ill.
INTEGRATED APPROACH TO FLIGHT CREW TRAINING
J. E. Carroll *In* NASA. Ames Research Center Flight Training Technol for Regional/Commuter Airline Operations Dec. 1984 p 103-119 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18015*# Pennsylvania Airlines, Middletown.
VIDEO CONCEPTS IN CRM TRAINING
Mike Yocum *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 123-135 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18016*# Metro Air, Ronkonkoma, N.Y.
USE OF SIMPLIFIER SCENARIOS FOR CRM TRAINING
Dan Weatherly *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 137-142 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18017*# Air Midwest, Inc., Wichita, Kans.
COMMUNICATIONS SKILLS FOR CRM TRAINING
Martin Shearer *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 143-146 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18018*# Scenic Air Lines, Inc., Las Vegas, Nev.
DYNAMIC TRAINING DEVICES IN CRM TRAINING
James Lawver *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 147-153 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18019*# Air Wisconsin, Inc., Appleton.
USE OF AIRPLANES FOR LOFT TRAINING
Mike Sele *In* NASA. Ames Research Center Flight Training for Regional/Commuter Airline Operations Dec. 1984 p 155-157 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18024*# Ransome Airlines, Philadelphia, Pa.
SIMULATION
Frank Foster and Robert Randle *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 211-219 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18025*# Scenic Air Lines, Inc., Las Vegas, Nev.
LOW COST TRAINING AIDS AND DEVICES
Jim Lawver and Al Lee *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 221-228 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18028*# Command Airways, Wappingers Falls, N.Y.
INNOVATIVE APPROACHES TO RECURRENT TRAINING
Hank Noon and Miles Murphy *In* NASA. Ames Research Center Flight Training Technol. for Regional/Commuter Airline Operations Dec. 1984 p 249-263 (For primary document see N85-18009 09-03)
Avail: NTIS HC A12/MF A01 CSCL 05I

N85-18561# Joint Publications Research Service, Arlington, Va.
ROLE OF ENGINEERING PSYCHOLOGY
A. Savayan *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-002) 23 Jan. 1985 p 26-30 Transl. into ENGLISH from Trud (Moscow), 18 Sep. 1984 p 3 (For primary document see N85-18559 09-51)
Avail: NTIS HC A09/MF A01

N85-18570# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF PSYCHOLOGICAL SUPPORT OF AUTOMATED ORGANIZATION CONTROL SYSTEMS Abstract Only
B. S. Berezkin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 65 Transl. into ENGLISH from Psikhologicheskiy Zh. (Moscow), v. 5, no. 4, Jul. - Aug. 1984 p 74-82 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

N85-18571# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF PSYCHOLOGICAL SUPPORT OF AUTOMATED ORGANIZATION CONTROL SYSTEMS Abstract Only
B. S. Berezkin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 65-66 Transl. into ENGLISH from Psikhologicheskiy Zh. (Moscow), v. 5, no. 4, Jul. - Aug. 1984 p 74-82 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-18579*# Stanford Univ., Calif.
COLOR MEASUREMENT AND DISCRIMINATION
Brian A. Wandell Feb. 1985 82 p refs
(Contract Ncc2-44)
(NASA-CR-3824; NAS 1.26:3824) Avail: NTIS HC A05/MF A01 CSCL 05H

Theories of color measurement attempt to provide a quantative means for predicting whether two lights will be discriminable to an average observer. All color measurement theories can be characterized as follows: suppose lights a and b evoke responses from three color channels characterized as vectors, v(a) and v(b); the vector difference v(a) - v(b) corresponds to a set of channel responses that would be generated by some real light, call it *. According to theory a and b will be discriminable when * is detectable. A detailed development and test of the classic color measurement approach are reported. In the absence of a luminance component in the test stimuli, a and b, the theory holds well. In the presence of a luminance component, the theory is clearly false. When a luminance component is present discrimination judgements depend largely on whether the lights being discriminated fall in separate, categorical regions of color space. The results suggest that sensory estimation of surface color uses different methods, and the choice of method depends upon properties of the image. When there is significant luminance variation a categorical method is used, while in the absence of significant luminance variation judgments are continuous and consistant with the measurement approach. M.G.

N85-18580# Army Natick Research and Development Command, Mass.
A SYSTEMS ANALYSIS OF ALTERNATIVE CONCEPTS FOR AIRCREW COLD WEATHER CLOTHING Final Report
J. M. Walker Mar. 1983 181 p
(DA Proj. 1L6-63747-D-669)
(AD-A148805; NATICK/TR-84/045) Avail: NTIS HC A09/MF A01 CSCL 06/17

This analysis was performed in support of a requirement to develop a new clothing system for Army aircrews operating in regions where minimum winter temperatures are between 0 F (-17.8 C) and -60 F (-51.1 C). Each of five proposed clothing system concepts was evaluated to determine its feasibility and its effectiveness in satisfying the essential requirements specified in the Letter of Agreement. Two analytical models which simulate body cooling for various metabolic and environmental assumptions were used to determine the clothing insulation (clo) values required to provide thermal protection. Since the results indicated that auxiliary heated clothing items especially for the hands and feet will be necessary, an evaluation of potential power sources is included in the study. The report recommends that either two ensembles or a basic and an augmented version of the same ensemble be designed. The basic system will be worn in cold and intermediate cold regions and should be designed using state-of-the-art technology to protect to -15 F (-26.1 C). The other ensemble will be worn in extreme cold climates where temperatures can fall to -60 F (-51.1 C). GRA

N85-18581# Army Construction Engineering Research Lab., Champaign, Ill.
CLOSED-LOOP CONCEPTS FOR THE ARMY: WATER CONSERVATION, RECYCLE, AND REUSE Final Report
E. D. Smith, J. T. Bandy, W. P. Gardiner, and F. Huff Nov. 1984 55 p
(DA Proj. 4A7-62720-A-896)
(AD-A148839; CERL-TR-N-85/01) Avail: NTIS HC A04/MF A01 CSCL 13/2

Potential commitment of U.S. Army troops in the Middle East and Southwest Asia has raised the issue of water supply in the success of combat operations. Moreover, increased demands for water in the face of growing ground and surface water pollution, changes in global weather patterns, and expanding agriculture may affect the Army's mission in the future both at home and abroad. Coupled with increasing costs for potable water and outside wastewater treatment, this outlook suggests a clear need for conservative water use at Army installations. To update existing regulations for Department of Defense facilities, a closed-loop approach is proposed. Water conservation, recycling, and reuse in various combinations can be initiated to reduce the need for fresh water and simultaneously cut the cost of heating wasted water. The closed-loop measures applying to a given installation must be determined individually. Factors such as geography, climate, population numbers, and mission are assessed and then the feasibility of each conservation, recycle, and reuse measures is judged. Possibilities for using closed-loop technology are explored for several types of Army installations. GRA

N85-17983*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECTS OF TIME DELAY IN MAN-MACHINE CONTROL SYSTEMS: IMPLICATIONS FOR DESIGN OF FLIGHT SIMULA-

TOR VISUAL-DISPLAY-DELAY COMPENSATION
D. F. Crane *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 331-343 Sponsored by NASA (For primary document see N85-17962 09-01)
(AD-P004329) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-18567# Joint Publications Research Service, Arlington, Va.
WORK CAPACITY OF HEAT AND ELECTRIC POWER PLANT OPERATIONS WORKING 12 HOUR DAY AND NIGHT SHIFTS Abstract Only
A. O. Navakatikyan, V. V. Kainish, and V. B. Lastovchenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 63 Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 3, Mar. 1984, p 88-89 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

N85-18568# Joint Publications Research Service, Arlington, Va.
SUCCESS IN LEARNING OCCUPATION OF CHEMICAL PRODUCTION TECHNICIAN AS FUNCTION OF CERTAIN PERSONALITY TRAITS AND DEVELOPMENT OF PSYCHOPHYSIOLOGICAL FUNCTIONS Abstract Only
N. D. Bobrishcheva-Pushkina *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 63-64 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 7, Jul. 1984 p 22-26 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

N85-18569# Joint Publications Research Service, Arlington, Va.
STUDY OF BODILY FUNCTIONAL STATUS AND QUALITY OF CONTROLLING ACTION OF POWER UNIT OPERATORS WITH VARIOUS INTENSITIES OF LABOR Abstract Only
Yu. P. Paltsev, A. V. Koslesnikova, L. I. Lipkina, and D. K. Fedotov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-007) 6 Feb. 1985 p 64 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 8, Aug. 1984 p 37-42 (For primary document see N85-18566 09-51)
Avail: NTIS HC A11

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-18582 Southern Methodist Univ., Dallas, Tex.
CONCURRENCY IN A DATA FLOW DATABASE MACHINE Ph.D. Thesis
Margaret Holder Eich 1984 259 p
Avail: Univ. Microfilms Order No. DA8425703

A new data base concurrency control mechanism utilizing specialized data flow graphs, data base flow graphs (DBFG) is introduced. A data base flow graph is an extension of normal data flow graphs which is used to show data dependencies between data base operations (both intratransaction and intertransaction). The dependencies shown in a DBFG define a multiple transaction schedule of data base operations which is serializable. With DBFG scheduling, concurrency control is implicitly obtained by ensuring that all schedules of data base operations are valid data flow schedules. Thus, conflicting operations must be serialized because there is a directed path between them in the associated DBFG. Unlike locking, DBFG scheduling requires no explicit concurrency control messages to ensure data base consistency. When a transaction enters a system utilizing DBFG scheduling, the query dag associated with the transaction must be merged with the existing DBFG. Likewise, when a transaction terminates, it must be removed from the DBFG. Dissert. Abstr.

N85-18583*# Old Dominion Univ., Norfolk, Va. Dept. of Geology.
DEVELOPMENT AND OPERATION OF A REAL-TIME DATA ACQUISITION SYSTEM FOR THE NASA-LaRC DIFFERENTIAL ABSORPTION LIDAR Final Technical Report, 1 Jan. - 31 Dec. 1984
Carolyn Butler Jan. 1985 54 p refs Original contains color illustrations
(Grant NCC1-28)
(NASA-CR-174384; NAS 1.26:174384; GSTR-85-1) Avail: NTIS HC A04/MF A01 CSCL 09B

Computer hardware and software of the NASA multipurpose differential absorption lidar (DIAL) sysatem were improved. The NASA DIAL system is undergoing development and experimental deployment for remote measurement of atmospheric trace gas concentration from ground and aircraft platforms. A viable DIAL system was developed with the capability of remotely measuring O3 and H2O concentrations from an aircraft platform. Test flights were successfully performed on board the NASA/Goddard Flight Center Electra aircraft from 1980 to 1984. Improvements on the DIAL data acquisition system (DAS) are described. B.G.

N85-18584*# Alabama Univ., Huntsville. Dept. of Computer Science.
DDL SYSTEM: DESIGN SYSTHESIS OF DIGITAL SYSTEMS Final Technical Report, 1 Oct. 1978 - 31 Jan. 1983
Sajjan G. Shiva Jan. 1983 103 p refs
(Contract NAS8-33096)
(NASA-CR-170759; NAS 1.26:170759) Avail: NTIS HC A06/MF A01 CSCL 09B

Digital Systems Design Language was integrated into the CADAT system environment of NASA-MSFC. The major technical aspects of this integration are summarized. Automatic hardware synthesis is now possible starting with a high level description of the system to be synthesized. The DDL system provides a high level design verification capability, thereby minimizing design changes in the later stages of the design cycle. An overview of the DDL system covering the translation, simulation and synthesis capabilities is provided. Two companion documents (the user's and programmer's manuals) are to be consulted for detailed discussions. Author

N85-18585# Center for Naval Analyses, Alexandria, Va.
THE CARE AND FEEDING OF MAGNETIC TAPES
P. A. Reslock Jul. 1984 19 p
(Contract N00014-83-C-0725)
(AD-A145853; CNA-PP-418) Avail: NTIS HC A02/MF A01 CSCL 14/3

There are many obstacles to successfully acquiring machine-readable data. Difficulties usually occur during the physical transfer of the data from one site to another, the most common method being magnetic tapes. Yet, even with higher quality tape and more efficient tape drives, tape processing is still plagued with problems. Parity errors, incompatible tape levels, multiple encoding schemes,

and poor quality media have all contributed to tape user's frustation. In an attempt to educate the nontechnical professional, this paper gives an overview of the technical aspects of magnetic tapes and their use. Topics include the physical aspects of magnetic tapes, how data is stored on tape, recording modes, tape errors, and their prevention. A data archivist faces two main tasks: data acquisition and data maintenance. To acquire data, you must know how data is stored on tape and what your installation can handle. The information necessary to successfully transfer data between sites will be covered in the following section. Housekeeping measures essential to keeping magnetic tapes readable will be covered in the Tape Maintenance section. GRA

N85-18586# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
DESIGN AND ANALYSIS OF AN ACCESS CONTROL SYSTEM FOR A MULTI-BACKEND DATABASE SYSTEM M.S. Thesis
Ali Ekici Jun. 1984 114 p
(AD-A148750) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis describes the design and analysis of an access control mechanism for a multi-backend database system (MDBS). The MDBS utilizes a minicomputer as the controller and a number of minicomputers and their disk systems as the backends. The database is distributed over the dedicated disk systems of the backends. The operations on the database are performed by the backends in parallel. Thus, the performance gain of the system is dependent on the number of backends in the system. Each backend performs its own access control operations using duplicated access control information. GRA

N85-18587# Sandia Labs., Livermore, Calif. Exploratory Technology Div.
MEDIUM SPEED COMPUTER INTERFACE (DIGITIZER) FOR GENERAL PURPOSE DATA ACQUISITION
A. R. VanHook Aug. 1984 42 p
(Contract DE-AC04-76DR-00789)
(DE85-001585; SAND-84-8234) Avail: NTIS HC A03/MF A01

A simple NIM (Nuclear Instrument Module) compatible analog to digital converter which offers significant improvements over commercial units was developed. The converter has a 2 microsecond A/D and will digitize unipolar signals ranging in amplitude from one millivolt to ten volts. A key feature is the precision track-and-hold amplifier which is a front end for the analog-to-digital converter circuitry producing conversion accuracies of 0.01% in 500 ns. The settling time and the conversion time allow for a maximum data rate of 500 kHz with a total system nonlinearity of 0.06%. DOE

N85-18227# Joint Publications Research Service, Arlington, Va.
OPTICAL COMPUTER STUDIES AT UK'S HERIOT-WATT UNIVERSITY
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-003) 18 Jan. 1985 p 12-13 Transl. into ENGLISH from Wirtschaftswoche (Dusseldorf), 2 Nov. 1984 p 96; 98 (For primary document see N85-18224 09-31)
Avail: NTIS HC A05/MF A01

N85-18661# Joint Publications Research Service, Arlington, Va.
DATA ACQUISITION, MEASUREMENT DEVICES AT 1984 LEIPZIG SPRING FAIR
K. Eckert, G. Raab, and B. Kasper *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-005) 4 Feb. 1985 p 14-31 Transl. into ENGLISH from Radio Fernsehen Elektron. (East Berlin), v. 33, no. 6, Jun. 1984 p 355-363 (For primary document see N85-18659 09-70)
Avail: NTIS HC A04/MF A01

N85-18662# Joint Publications Research Service, Arlington, Va.
COMPUTER EQUIPMENT AT 1984 LEIPZIG SPRING FAIR
V. Loeschner and B. Kasper *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-005) 4 Feb. 1985 p 32-39 Transl. into ENGLISH from Radio Fernsehen Elektron. (East Berlin), v. 33, no. 7, Jul. 1984 p 430-463 (For primary document see N85-18659 09-70)
Avail: NTIS HC A04/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-18588 Wisconsin Univ., Madison.
AN OPTIMAL PARALLEL PROCESSING METHOD FOR INVERTING SPARSE MATRICES Ph.D. Thesis
Ramon Betancourt 1984 234 p
Avail: Univ. Microfilms Order No. DA8419934

The problem studied in this thesis is concerned with the design of efficient parallel algorithms for obtaining the sparse and full inverse of a matrix on a computer consisting of a number of processing elements. The inversion method proposed is based on the triangular factors of the matrix. The principle of parallel triangulation of sparse matrices is thus described extensively. To expose parallelism the triangulation process is formulated as a multi-task system where each task consists of one numeric operation. The task system is represented by a directed acrylic graph called triangulation graph. A theoretical model is then established for the parallel computation of the sparse inverse of a matrix. It is shown that the solution process can also be represented by a multi-task system from which concurrent excution of arithmetic operations can be identified. The task of inverting a matrix is represented by a directed acrylic graph. The relations between the triangulation graph and the graph corresponding to the sparse inversion step are given. Dissert. Abstr.

N85-18589 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
DIGITAL SIGNATURES: AN UPDATE
D. W. Davies and W. L. Price Oct. 1984 8 p refs Presented at Intern. Conf. on Computer Commun., Atlanta, Oct. 1980, and Sydney, Oct. - Nov. 1984
(NPL-DITC-51/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

Generation of digital signatures on documents and messages is discussed. It is shown that the Rivest., Shamir, and Adleman system signature is considerably facilitated by calculating a hash function of the message; then the result of the function is signed, rather than the message. It is shown that some hash functions are weak in reality. A strong hash function is suggested. The role of signatures in electronic funds transfer systems is considered. Author (ESA)

N85-18590*# George Washington Univ., Washington, D.C. Dept. of Electrical Engineering and Computer Science.
RASTER GRAPHICS EXTENSIONS TO THE CORE SYSTEM Final Report, 1 May 1981 - 15 Nov. 1984
James D. Foley Nov. 1984 7 p refs
(Grant NAG-1-185)
(NASA-CR-174348; NAS 1.26:174348) Avail: NTIS HC A02/MF A01 CSCL 09B

A conceptual model of raster graphics systems was developed. The model integrates core-like graphics package concepts with contemporary raster display architectures. The conceptual model of raster graphics introduces multiple pixel matrices with associated index tables. R.S.F.

N85-18591# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
MODELING RELATIONSHIPS USING GROUPS AND ITEMS M.S. Thesis
Dan S. Compton Dec. 1984 153 p
Avail: NTIS HC A08/MF A01

A method for organizing relationships among groups of objects called Groups and Items is developed. The computer science technology of hierarchical data structures is used extensively. By

using Groups and Items it is possible to describe hierarchical geometric relationships. Geometric coordinate transformation matrices are used to keep track of the relative positioning among the groups and items. A practical traversal algorithm is developed to effectively use the data organization. Hierarchical data organization and traversal routines are coded into a FORTRAN subroutine package called GRUPIT. GRUPIT was interfaced with MOVIE.BYU. The technical manual, the users guide, the interface procedure and a listing of all GRUPIT code are provided herein. Author

N85-18592# Duke Univ., Durham, N. C. Dept. of Computer Science.
SPADE: SERIES-PARALLEL DIRECTED ACYCLIC GRAPH EVALUATOR
R. Sahner and K. S. Trivedi Nov. 1984 30 p
(Grant AF-AFOSR-0132-84; NSF MCS-83-0200)
(AD-A148458; CS-1984-15; AFOSR-84-1096TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

A model for the stochastic analysis of directed acyclic graphs is developed. These graphs represent node-activity networks where the distribution function associated with a node is assumed to be a mixture of Erlangs. The distribution function of the graph execution time is computed in a semi-symbolic form. Applications of the model for the evaluation of concurrent program execution time and to the reliability analysis of fault-tolerant systems are discussed. Author (GRA)

N85-18593# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics and Logistics Dept.
COMPUTER CENTER CDC LIBRARIES/UTILITY (PROGRAMS) Final Report
D. V. Sommer Jun. 1984 288 p
(AD-A148680; DTNSRDC/CMLD-84-14) Avail: NTIS HC A13/MF A01 CSCL 09/2

This reference manual describes programs which are utilities such as tape and disk dumps, listers, selective copies, document generators/printers, card reformatter library maintenance. CLIB/U lists programs by functional category and alphabetically with a descriptive title. All machine readable documents detailing the use of these programs are included. Author (GRA)

N85-18594# Naval Research Lab., Washington, D. C.
FLAD USER'S MANUAL: FLAD FILE CONTENTS
G. P. Mueller 12 Dec. 1984 12 p
(AD-A148700; NRL-MR-5470) Avail: NTIS HC A02/MF A01 CSCL 09/2

During this quarter, the error trellis syndrome decoding techniques for convolutional codes was developed. This algorithm is specialized then to the entire class of systematic convolutional codes. Finally, this algorithm is applied to the high rate Wyner-Ash convolutional codes. A special example of the one-error-correcting Wyner-Ash code, a 3/4 rate code is treated in this report. GRA

N85-18595# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
PROPOSAL FOR A SMALL SCHEME IMPLEMENTATION Interim Report
R. Schooler and J. W. Stamos Oct. 1984 26 p
(Contract N00014-83-K-0125)
(AD-A148707; MIT/LCS/TM-267) Avail: NTIS HC A03/MF A01 CSCL 09/2

Scheme is a lexically scoped dialect of LISP developed at MIT. This report determines the feasibility of implementing a Scheme-based programming/application environment on a contemporary personal computer such as the Apple Macintosh. The absence of virtual memory, coupled with a limitation on the maximum amount of physical memory, means that space is at a premium. The use of bytecodes is suggested and a possible instruction set sketched. Because of space constraints, tail-recursion optimization and an efficient mechanism for the reclamation of inaccessible contexts are also examined. Using the built-in operating system and user interface of the Macintosh realizes speed, functionality, and friendliness but raises a number of interesting issues. For example, the Pascal and assembler routines make many assumptions about data representation, type checking, and parameter passing. Since an implementation of Scheme is likely to have radically different conventions, the two environments must be interfaced smoothly and efficiently. In addition to the bytecoded instruction set, the authors specify the virtual machine informally, discuss the implementation of basic and advanced features, estimate the performance of such an implementation, and finally evaluate the proposed design. Author (GRA)

N85-18596# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
PARTIAL EVALUATION AS A MEANS OF LANGUAGE EXTENSIBILITY M.S. Thesis
Richard Schooler Aug. 1984 97 p
(Contract N00014-83-K-0125)
(AD-A148730; MIT/LCS/TR-324) Avail: NTIS HC A05/MF A01 CSCL 09/2

An optimization technique known as partial evaluation is explored. A partial evaluator optimizes code by making use of static information about program values. Our partial evaluator is designed to optimize mainly applicative code. Un-checked assertions are used to identify applicative constructs in the input code and guide the partial evaluator. Side-effects in the input code are retained but are not optimized. This thesis is part of a larger project devoted to language extensibility. Source language constructs will be transformed into kernel language constructs by syntactic transforms. These transforms will add applicative code for type-checking, etc. To assess the effectiveness of the partial evaluator, some examples of kernel language programs are partially evaluated, and the results discussed. GRA

N85-18597# General Research Corp., Santa Barbara, Calif.
JOVIAL J73 AUTOMATED VERIFICATION SYSTEM: IMPLEMENTATION PHASE Final Report, May 1980 - Sep. 1983
Carolyn Gannon Mar. 1984 73 p
(Contract F30602-79-C-0265; AF Proj. 2532)
(AD-A148732; GRC-CR-9-947; RADC-TR-84-33) Avail: NTIS HC A04/MF A01 CSCL 09/2

The JOVIAL J73 Automated Verification System (J73AVS), is an interactive computer program that analyzes any source code written in JOVIAL J73. The primary objective of J73AVS is to provide static and dynamic testing assistance. To do this, J73AVS detects a variety of semantic and data flow errors, reports execution coverage (i.e., frequency of statements, control branches, and procedures executed by each test case), reports execution timing (in terms of CPU milliseconds) for procedures or certain user-designated portions of the JOVIAL J73 program, reports execution tracing (ordering) of control branches or procedures, and keeps track of the test coverage history from run to run. To assist with function testing of programs, J73AVS provides a local assertion construct which triggers an output message when it is violated. J73AVS also provides a large number of source analysis reports, ranging from symbol cross references and descriptions of symbol usages to procedure calling trees and descriptions of all procedures being analyzed. These reports are useful for original code development, rehosting foreign code, debugging and testing, code enhancement, and code maintenance. This report briefly describes the features of J73AVS and provides specific details on how to obtain the J73AVS software and selected project reports. GRA

N85-18598# SRI International Corp., Menlo Park, Calif. Computer Science Lab.
REPRESENTATION AND REFINEMENT OF VISUAL SPECIFICATIONS IN PEGASYS Final Technical Report, May 1981 - Feb. 1984
Mark S. Moriconi Jun. 1984 59 p
(Contract F30602-81-K-0176; AF Proj. D139)
(AD-A148733; RADC-TR-84-128) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes techniques for the representation and

refinement of visual specifications in the context of PegaSys (Programming Environment for the Graphical Analysis of SYStems), a system that supports a visual paradigm for the development and explanation of large software designs. Visual specifications are pictorial, mostly non-textual, descriptions of interactions among conceptual entities in a system design. Pictures have a computational meaning that is represented in a formal language, called the form calculus. The form calculus is extensible in that it contains a core set of primitives which can be used to build a variety of abstract design models. Complexity is managed by means of picture hierarchies, whose construction is guided by a precise refinement methodology. The representation and refinement techniques presented have been implemented and all reasoning is fully automatic and efficient. Determining the validity of a picture refinement, for example, involves either the application of a single graph algorithm or the proof of a formula whose predictions range over small, finite sets. Excerpts from a sample session with PegaSys are used to illustrate a hierarchy of visual specifications. GRA

N85-18599# Florida Univ., Gainesville. Coll. of Engineering.
IDENTIFICATION OF EMERGING DESIGNER NEEDS AND HIGH PAYOFF CAE TOOLS
G. E. Nevill, Jr., R. W. Patterson, and L. T. Adams, Jr. Mar. 1984 65 p refs
(Contract W-7405-eng-48)
(DE85-000755; UCRL-15614) Avail: NTIS HC A04/MF A01

CAE tools which offer the potential for dramatic enhancement of human performance are discussed. In the near term, principal CAE payoffs will come from further improvements in existing tools, based on continuing rapid computer hardware performance/cost improvements, from wider availability of tools, from new tools such as 3D solid modeling and voice I/O, and from networking and shared data bases to provide integration of the entire engineering endeavor. In the long term, a new generation of intelligence CAE tools is expected, based on results emerging from the field of Artificial Intelligence. These intelligent CAE tools will, in the next decade, focus around the concept of the Expert System in which human expert knowledge is acquired, organized, and made available to others. These new tools will also begin to change in a fundamental way the relations between computers and humans, and as they increasingly become colleagues and members of project teams, they may fundamentally change the relations between the people themselves. Therein lies the promise and the danger. DOE

N85-18600# California Univ., Berkeley. Lawrence Berkeley Lab.
INTRODUCTION TO LBL GRAPHICS
Aug. 1984 244 p
(Contract DE-AC03-76SF-00098)
(DE85-000389; LBL-PUB-3045) Avail: NTIS HC A11/MF A01

The Computing Services Department supports a number of graphics software packages on the VAX machines, primarily on the IGM VAX. These packages will drive a large variety of different graphical devices, terminals (including various Tektronix terminals, the AED 512 color raster terminal, the IMLAC Series II vector list processor terminal and others), various styles of plotters and the DICOMED D48 film recorder. The following graphic software packages are presented: Tell-A-Graf, Cuechart, Tell-A-Plan, Data Connection, DI-3000, Contouring, Grafmaker (including Grafeasy), Grafmaster, Movie.BYU, Grafpac, IDDS, UGS/HPLOT/HBOOK, and SDL/SGL. DOE

N85-18601# Pacific Northwest Lab., Richland, Wash.
ORGANIZATIONAL TOOLS FOR DATA ANALYSIS ENVIRONMENTS
D. B. Carr, P. J. Cowley, M. A. Whiting, and W. L. Nicholson Jul. 1984 13 p refs Presented at the Ann. Meeting of the American Statistical Association (ASA), Philadelphia, 12 Aug. 1984
(Contract DE-AC06-76RL-01830)
(DE85-000396; PNL-SA-12474; CONF-840849-6) Avail: NTIS HC A02/MF A01

Organizational tools and graphical interaction displays that are used to assist in data analysis are described. The graphical displays depict the hierarchical relationship among saved states from data analysis sessions as a tree. Each node on the tree represents a data analysis environment, which includes icons that indicate availability of plots and annotations, textual descriptions, and oral descriptions on cassette tape. A graphics work pad is used to select a data analysis environment from which the analysis is to proceed. Menus and information windows provide assistance in reviewing the analysis tree, input and retrieval of annotations, and the creation and retrieval of environments. DOE

N85-18602# Pacific Northwest Lab., Richland, Wash.
ROLE OF ENVIRONMENTS IN MANAGING DATA ANALYSIS
W. L. Nicholson, D. B. Carr, P. J. Cowley, and M. A. Whiting May 1984 12 p refs Presented at the Ann. Meeting of the American Statistical Association (ASA), Philadelphia, 12 Aug. 1984
(Contract DE-AC06-76RL-01830)
(DE85-000397; PNL-SA-12457; CONF-840849-5) Avail: NTIS HC A02/MF A01

Data analysis is a clue-driven process which evoles as a network of analysis paths, some fruitful and some unproductive. Data analysis environments as entities and associated interactive software provide the data analyst with tools for effective management of the process. The analyst may save the state of the process at any point of the network as a data analysis environment. Environments may be restored to review previous results, verify what was done, or to continue the analysis. Other functions provide detailed information about the analysis including displays of accessible data and lists of previously traversed analysis paths. This paper describes the maintenance and capture of data and auxiliary information as environments and the interaction of the analyst with the environments. DOE

N85-18603# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
USER'S GUIDE TO MIX: A COMPUTER CODE FOR FITTING MIXTURE DISTRIBUTIONS TO DATA
C. L. Atwood Sep. 1984 25 p refs
(Contract DE-AC07-76ID-01570)
(DE85-001451; EGG-EA-6703) Avail: NTIS HC A02/MF A01

Rather than fitting data by a simple model, such as a normal, Poisson, or negative binomial distribution, it may be preferrable to use a mixture of such distributions. Methods for choosing a mixture model that fits the data well are presented and discussed. Then the computer code MIX is presented; all the commands are explained, to carry out the methods discussed earlier; use of MIX on the INEL Cyber is described; and a sample job is given. DOE

N85-18604# Sandia Labs., Albuquerque, N. Mex.
USER/PROGRAMMER GUIDE FOR UCMD 108 MULTI-VERTEX POLYARC/PATH INTEGRITY VERIFIER
L. J. LaFrance Aug. 1984 18 p refs
(Contract DE-AC04-76DP-00789)
(DE84-017173; SAND-84-1749) Avail: NTIS HC A02/MF A01

The UCMD 108 Version 2.0, an Applicon AGS/880-I User Command, is described. The program finds zero length polyarc/path component instances, verifies the closure of polygons, and verifies that the segments of polyarc/path components are parallel to their respective coordinate axes. The tests are performed on polyarcs and paths in the Applicon Graphics System view cube. The tests are optional. DOE

N85-18605# Oak Ridge National Lab., Tenn. Center for Engineering Systems Advanced Research.
PARALLEL ALGORITHMS FOR ROBOT DYNAMICS
J. Barhen and S. M. Babcock 1984 17 p refs Presented at the 1st World Conf. on Robotics Res., Bethlehem, Pa., 14 Aug. 1984
(Contract DE-AC05-84CR-21400)
(DE84-016563; CONF-8408103-2) Avail: NTIS HC A02/MF A01

Initial results in developing parallel algorithms for efficiency enhancement in real-time solutions of manipulator dynamics equations are reported. Two approaches to the solution of the

inverse dynamics problem are discussed. The first is concerned with the implementation of Newton-Euler equations in multiprocessors architecture with emphasis on asynchronous algorithms and interprocess communication. The alternative approach is based on an explicit state description of the manipulator dynamics, obtained using computer-assisted analytic simplifications of the symbolic Lagrange-Euler equations. Multicomputer and multiprocessor implementations are discussed. The construction of a compact knowledge-base in terms of associative memories is also suggested, to allow solutions of the inverse dynamics based on similarity. Future directions are also outlined. DOe

N85-18606# Sandia Labs., Albuquerque, N. Mex.
GENERATION OF RADIATION TRANSPORT GEOMETRY FROM COMPUTER-GENERATED DESIGN DATA
L. C. Jones and D. C. McKeon 1984 13 p refs Presented at the ANS Topical Meeting on Reactor Phys. and Shielding, Chicago, 17 Sep. 1984
(Contract DE-AC04-76DP-00789)
(DE84-017380; SAND-84-1789C; CONF-840901-12) Avail: NTIS HC A02/MF A01

The Monte Carlo method is the most widely used calculational technique for solving the neutron transport equation in complex, three-dimensional geometries. One of the most time-consuming and error-prone aspects of performing Monte Carlo calculations is the generation of geometry data necessary for describing three-dimensional solid objects. The capability to translate computer-kided-design definition data of solid objects to the geometry description used in Monte Carlo transport codes will significantly reduce the manpower required to perform radiation transport calculations in complex, three-dimensional geometries. Furthermore, the translation process will preserve the original solid model without introducing any human errors into the geometry description. Work on the translation of a particular type of computer-generated design data to a format suitable for the MORSE radiation transport code is presented and applications of its use in radiation transport calculations are discussed. DOE

N85-18607# Fermi National Accelerator Lab., Batavia, Ill.
SOFTWARE FOR EVENT ORIENTED PROCESSING ON MULTIPROCESSOR SYSTEMS
M. Fischler, H. Areti, J. Biel, S. Bracker, G. Case, I. Gaines, D. Husby, and T. Nash Aug. 1984 8 p refs Presented at the Symp. on Recent Develop. in Computing, Processor and Software Res. for High Energy Phys., Guanajuato, Mexico, 8 May 1984
(Contract DE-AC02-76CH-03000)
(DE84-016720; FERMILAB-CONF-84/64; CONF-8405162-5) Avail: NTIS HC A02/MF A01

Computing intensive problems that require the processing of numerous essentially independent events are natural customers for large scale multimicroprocessor systems. The software required to support users with such problems in a multiprocessor environment is described. It is based on experience with and development work aimed at processing very large amounts of high energy physics data. DOE

N85-18608# California Univ., Livermore. Lawrence Livermore Lab.
BEYOND FAULT TREES TO FAULT GRAPHS
H. P. Alesso, P. Prassinos, and C. F. Smith Sep. 1984 24 p refs Presented at the ANS/ENS Topical Meeting on Probabilistic Safety Methods and Appl., San Francisco, 24 Feb. 1984
(Contract W-7405-eng-48)
(DE84-017022; UCRL-91463; CONF-840295-2-Summ) Avail: NTIS HC A02/MF A01

Fault Graphs are the natural evolutionary step over a traditional fault tree model. A Fault Graph is a faulure oriented directed graph with logic connectives that allows cycles. The Fault Graph is intentionally constructed to trace the piping and instrumentation drawing (P and ID) of the system, but with logical AND and OR conditions added. The Fault Graph is evaluated with computer codes based on graph theoretic methods. Fault Graph computer codes are based on graph concepts, such as path set (a set of nodes traveled on a path from one node to another) and reachability (the complete set of all possible paths between any two nodes). These codes are used to find the cut sets (any minimal set of component failures that will fail the system) and to evaluate the system reliability. DOE

N85-18609# California Univ., Livermore. Lawrence Livermore Lab.
MULTITASKING KERNEL FOR THE C AND FORTRAN PROGRAMMING LANGUAGES
E. D. Brooks, III Sep. 1984 19 p
(DE85-001799; UCID-20167) Avail: NTIS HC A02/MF A01

A multitasking kernel for the C and FORTRAN programming languages which runs on the Unix operating system is presented. The kernel provides a multitasking environment which serves two purposes. The first is to provide an efficient portable environment for the coding, debugging and execution of production multiprocessor programs. The second is to provide a means of evaluating the performance of a multitasking program on model multiprocessors. The performance evaluation features require no changes in the source code of the application and are implemented as a set of compile and run time options in the kernel. DOE

N85-18610# Sandia Labs., Albuquerque, N. Mex. Environmental Test Div.
USER'S MANUAL: MENU-DRIVEN DATA GRAPHING PROGRAM FOR THE TEKTRONIX 7912AD AND 7612D TRANSIENT DIGITIZER SYSTEM
James L. Mitchell Aug. 1984 87 p
(Contract DE-AC04-76DR-00789)
(DE85-002151; SAND-84-8016) Avail: NTIS HC A05/MF A01

Instructions for the use of the Explosive Firing Facility's menu-driven data graphing program are provided. Written for a Tektronix general-purpose-interface-bus controlled transient digitzer system, this SPS BASIC program enables the user to graph single-shot data that has been acquired and stored in permanent data files by the Firing Facilities Data Acquisition program. Limited post-shot data analysis, quick-look graphics output, and formatting data output are available. DOE

N85-18611# Fondazione Ugo Bordoni, Rome (Italy).
HIGH LEVEL LANGUAGES IN PROTOCOL SPECIFICATION AND VERIFICATION
Achille Pattavina and Sebastiano Trigila (Rome Univ.) Dec. 1983 18 p refs Sponsored by Istituto Superiore P.T.
(FUB-51-1983) Avail: NTIS HC A02/MF A01

High level language model (HLM) specification and verification are compared with state transition models (STM). The HLM specify protocols better than STM, as control and data transfer phases can be effectively represented; neverthless, no unified specification language exists, while STM appear well-established. Reachability analysis, typical of STM, best suits automatic verification. Mixed specification models, i.e., those based on the state concept, but in which the state is provided with a set of high level expressions, are the most promising for specification and verification. For specification, control and data phases are represented satisfactorily through the use of states and expressions. For verification, state space explosion is avoided, due to a careful identification of states, and the limited portions of high level specification allow the use of automated aids. Author (ESA)

N85-18612# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
COMPUTER PROGRAMS FOR THE ADJUSTMENT OF INDIRECT OBSERVATION WITH CONDITION EQUATIONS BETWEEN THE UNKNOWNS [EDV-PROGRAMME FUER DIE AUSGLEICHUNG VERMITTELENDER BEOBACHTUNGEN MIT BEDINGUNGSGLEICHUNGEN ZWISCHER DEN UNBEKANNTEN]
Dieter Ehlert 1984 191 p refs In GERMAN; ENGLISH summary
(Ser-B-268-Mitt-170; ISSN-0071-9196) Avail: NTIS HC A09/MF A01

A least squares adjustment method which copes with prin-

cipal unknowns included in the final normal equation system, and auxiliary unknowns that may only occur in a series of successive geodetic observation equations is presented. Condition equations between the principal unknowns, condition equations between the auxiliary unknowns of similar or different sets are permissible. From linear observation equations and linear condition equations, the values and convariance of the auxiliary unknowns are computed. Corrections and standard deviations of the adjusted observations are obtained as well as information on the systems of the observation and condition equations, the condition of the normal equation matrix, and the accuraccy of the numerical computation. The program requires relatively little storage space. Author (ESA)

N85-18613# Rolls-Royce Ltd., Derby (England).
THE PLANNING OF FLEXIBLE MANUFACTURING SYSTEMS
H. Goebel (Burkhardt und Weber KG), O. Gunsser (Heller GmbH), J. Herrmann (Pittler AG), H. Hobzl (Mueller (Karl) GmbH), D. Hormann (Technische Univ., Aachen), W. Junghanns (Technische Univ., Aachen), H. Kuhnert (Heidel-Berger Druckmaschinen AG), A. Ledergerber (Gildemeister und Cie AG), H. Maas (Heyligenstaedt und Cie GmbH), F. Sedelmaier (Siemens AG, Munich) et al 8 Nov. 1984 39 p refs Transl. into ENGLISH from Ind.-Anzeiger, v. 93, no. 60, 1971 p 1512-1521
(PNR-90230; Trans-16496/TLT-00914) Avail: NTIS HC A03/MF A01

Improvement of productivity by introducing automatic manufacturing systems is discussed. Improvement of economic efficiency by adapting manufacturing facilities to production tasks; and increased flexibility to ensure that production can quickly be adapted to varying manufacturing needs are advocated. Author (ESA)

N85-18614# Rolls-Royce Ltd., Derby (England).
THE USE OF SIMULATION FOR THE TECHNICAL AND ECONOMIC EVALUATION OF FLEXIBLE MANUFACTURING SYSTEMS. PART 2: RESULTS OF THE SIMULATION
Wirtsch (Technische Univ., Aachen), D. Etzenbach (Technische Univ. Aachen), and E. Westkaemper 12 Nov. 1984 13 p refs Transl. into ENGLISH from Ind.-Anzeiger, v. 97, no. 60, 25 Jul. 1975 p 1302-1305
(PNR-90233-Pt-2; Trans-16391/TLT-00900) Avail: NTIS HC A02/MF A01

A simulation model to represent the production processes in flexible manufacturing systems which can be used at the planning and operating stage of such systems was investigated. Results show that the model can be used to make a rough assessement of the economic efficienty of flexible manufacturing systems compared with numerical control machines. Author (ESA)

N85-18615# Rolls-Royce Ltd., Derby (England).
CONTROL OF THE MANUFACTURING PROCESS AND MATERIAL FLOW IN FLEXIBLE MANUFACTURING SYSTEMS
W. Doettling (Berlin Engineering Univ.) and J. Firnau (Berlin Engineering Univ.) 12 Nov. 1984 23 p refs Transl. into ENGLISH from WT Z. fuer Ind. Fertigung, v. 67, 1977 p 397-404
(PNR-90234; Trans-16392/TLT-00901) Avail: NTIS HC A02/MF A01

A control system for flexible manufacturing systems to control work stations and the manufacturing process was developed. Work scheduling and material flow control are described. The coordinated action of the control and monitoring systems enables malfunction in production process to be detected without delay and the steps to be taken at the various control levels. Automation of workpiece flow imposes additional tasks on the system director and material-flow control, which are already taken into account in the program system. Author (ESA)

N85-18616# Rolls-Royce Ltd., Derby (England).
THE CONTROL OF MANUFACTURING SYSTEMS FOR VARYING MEDIUM-BATCH PRODUCTION
Shinji Muraki and Yutaka Matsumura 12 Nov. 1984 24 p Transl. into ENGLISH from Z. fur Maschinenbau Konstruct. u. Fertigung, v. 12, Dec. 1985 p 773-832
(PNR-90235; Trans-16493/TLT-00911) Avail: NTIS HC A02/MF A01

A computer aided manufacturing system for machine tool operations is described. The tools are numerically controlled with peripheral units for loading and unloading. The system is available with processor control or a relay logic feedback system. Author (ESA)

N85-18617# Rolls-Royce Ltd., Derby (England).
STATE AND DEVELOPMENT OF THE MACHINE-TOOL INDUSTRY IN JAPAN. PART 2: FLEXIBLE MANUFACTURING SYSTEMS
F. Leonards and H. Mathes 12 Nov. 1984 7 p Transl. into ENGLISH from Z. Wirt. Fertigung (Berlin), v. 72, no. 7, 1977 p 349-351
(PNR-90236-Pt-2; Trans-16494/TLT-00912) Avail: NTIS HC A02/MF A01

A modular flexible computer aided manufacturing system was assessed in machining centers. Increases in productivity of machines with expensive hourly rates require a reduction in idle time and the use of multispindle machines for drilling and thread-cutting. Many users want to machine a workpiece completely with one clamping operation and to expand the tool system so that machining operations other than milling and drilling, e.g., broaching, are also possible. Technological advances and new cutting materials often require an adaptation of power and cutting speeds. It should be possible to alter machining limits of machining centers as necessary. It should be possible to expand machining centers and to develop them into a production line since many users of these machines cannot make long-term forecasts of the parts spectrum. Author (ESA)

N85-18618# Rolls-Royce Ltd., Derby (England).
MATERIAL FLOW IN THE MANUFACTURING SYSTEM: FAULT-DIAGNOSIS SYSTEMS AS SUPPORT FOR THE MAINTENANCE OF HIGHLY AUTOMATED MANUFACTURING SYSTEMS
E. Matull (MTU Motoren-u. Turbinen-Union Munchen GMBH) 14 Nov. 1984 10 p refs Transl. into ENGLISH from Z. Wirt. Fertigung (Hanover), v. 77, no. 1, 1982 p 25-27
(PNR-90238; Trans-16528/TLT-00916) Avail: NTIS HC A02/MF A01

Experience in a large commercial vehicle plant using advanced automation techniques is discussed. Maintenance services requirements can be met satisfactorily, provided the production and maintenance personnel involved are properly trained. The use of computer systems with efficient fault diagnosis is a prerequisite to ensure a high level of machine availability, particularly in complex manufacturing systems equipped with a large number of actuating elements. The exploitation of computer intelligence to support maintenance is increasingly important. Author (ESA)

N85-17972# Evans and Sutherland Computer Corp., Salt Lake City, Utah.
CIG (COMPUTER IMAGE GENERATION) DATA BASES IN AN INSTANCE: BITS AND PIECES
J. L. Costenbader *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 151-163 (For primary document see N85-17962 09-01)
(AD-P004318) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17989# Naval Training Equipment Center, Orlando, Fla.
ON-BOARD COMPUTER IMAGE GENERATOR (CIG) APPLICATIONS
D. R. Breglia and D. B. Coblitz *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 431-437 (For primary document see N85-17962 09-01)
(AD-P004335) Avail: NTIS HC A22/MF A01 CSCL 09/2

N85-17990# Rediffusion Simulation, Inc., Arlington, Tex.
CIG (COMPUTER IMAGE GENERATOR) GOES TO WAR: THE TACTICAL ILLUSION
J. B. Howie and M. A. Cosman *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 439-454 (For primary

document see N85-17962 09-01)
(AD-P004336) Avail: NTIS HC A22/MF A01 CSCL 01/2

62 COMPUTER SYSTEMS

Includes computer networks.

N85-18619 Illinois Inst. of Tech., Chicago.
ASYMPTOTIC ANALYSIS OF MARKOVIAN ACCESS CONTROL COMPUTER COMMUNICATION NETWORKS Ph.D. Thesis
John Anthony Cicero 1984 108 p
Avail: Univ. Microfilms Order No. DA8425304

This thesis gives a solution to the problem of dynamic analysis of large homogeneopus computer communication networks with Markovian access control and buffered users. A set of stochastic equations is introduced to accurately describe the communication network. The averaging theory for slow Markov walks is applied to the set of stochastic equations and a set of averaged equations is obtained. The averaged equations accurately describe the stochastic system for networks with ten or more stations. A load line analysis is used to accurately describe the number of packet arrivals to the network. Steady states are obtained from the intersection of the load line and the probability of transmission curve. Simulation results are presented to show that predicted steady states approximate actual steady states for networks with ten or more stations. Individual and total buffer occupancy is predicted for finite and infinite buffer networks. Dissert. Abstr.

N85-18620 Kansas Univ., Lawrence.
AN ULTRA RELIABLE COMPUTER COMMUNICATION NETWORK: THE DISPERSED SENSOR PROCESSING MESH Ph.D. Thesis
Larry Wayne Abbott 1984 228 p
Avail: Univ. Microfilms Order No. DA8424289

The dispersed sensor processing mesh (DSPM) is an ultra reliable computer communication network. The DSPM network is part of an experimental system used to pursue a proof of concept for an advanced fault tolerant communication strategy. The DSPM network incorporates sensors and effectors into an ultra reliable nodal network in which a central bus controller performs algorithms to grow and maintain the network. The experiments demonstrate that DSPM is an achievable communication network that can sustain failures and continue to function properly. This paper describes the concept, mechanization, and performance of the DSPM system is a real time flight critical environment. Three areas of performance are considered. In the first area of performance the growth and network maintenance algorithms are measured in terms of the growth time versus the number of failures.
Dissert. Abstr.

N85-18621 National Physical Lab., Teddington (England). Protocol Standards Group.
GATEWAY TESTING TECHNIQUES
H. X. Zeng and D. Rayner Oct. 1984 24 p refs
(NPL-DITC-49/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

The transverse method and the loop-back method were used to test two commercially available Yellow Book gateways. The separation method has more severe shortcomings and was excluded from practical investigations. The first two methods are suitable for testing open systems interconnection network relays. Experience suggests that the effort required to test gateways can be shared with that required to test end-systems, e.g., by sharing the encoder decoder and part of the test driver with an active tester for end-systems. However, the two testing systems differ from each other because of different testing configurations. For the same reason, the definition of pairs of tests for gateways would benefit from a different test specification language. The NBS end-system testing approach uses the definition of pairs of tests and may also benefit from use of a test pair specification language. Author (ESA)

N85-18622*# Kentron International, Inc., Hampton, Va. Aerospace Technologies Div.
SYSTEM SOFTWARE FOR THE FINITE ELEMENT MACHINE
Thomas W. Crockett and Judson D. Knott Feb. 1985 32 p refs
(Contract NAS1-16000)
(NASA-CR-3870; NAS 1.26:3870) Avail: NTIS HC A03/MF A01 CSCL 09B

The Finite Element Machine is an experimental parallel computer developed at Langley Research Center to investigate the application of concurrent processing to structural engineering analysis. This report describes system-level software which has been developed to facilitate use of the machine by applications researchers. The overall software design is outlined, and several important parallel processing issues are discussed in detail, including processor management, communication, synchronization, and input/output. Based on experience using the system, the hardware architecture and software design are critiqued, and areas for further work are suggested. Author

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N85-18623 State Univ. of New York, Buffalo.
DYNAMICS AND CONTROL OF GENERAL LINEAR LUMPED-PARAMETER SYSTEMS Ph.D. Thesis
Mehdi Ahmadian 1984 128 p
Avail: Univ. Microfilms Order No. DA8426013

A generalinear theory concerning the free vibrations, stability, and control of autonomous multiple-parameter systems is provided. The systems under consideration are divided into well-defined classes of symmetric, symmetrizable, and asymmetric systems. Various phenomena related to vibrations, stability, and control of these classes of systems are explored systematically. Several theorems concerning the basic properties and characteristic features of each class are formulated. For symmetrizable systems the effects of coefficient matrices on the nature of oscillations of the system are determined. It is shown that it is possible to predict the oscillatory behavior of such systems by simply studying the properties of certain combinations of the coefficient matrices. Furthermore, the stability of asymmetric systems is addressed. It is proposed that one can study the stability of this class of systems by satisfying some simple conditions, without computing the eigensolution. These conditions may be used to determine the effect of parameters on the stability of the system as well as to design a controller. Dissert. Abstr.

N85-18624# Oak Ridge National Lab., Tenn.
STRATEGY PLANNING BY AN INTELLIGENT MACHINE
C. R. Weisbin, G. deSaussure, J. Barhen, T. E. Swift, and J. C. White 1984 12 p refs Presented at the 1st World Conf. on Robotics Res., Bethlehem, Pa., 14 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE84-016609; CONF-8408103-1) Avail: NTIS HC A02/MF A01

Initial investigatrions in developing efficient strategies to be used by an autonomous robot with hierarchical control structure operating in an unstructured, real-world environment are described. This research is an integral part of a systems with complementary efforts in mathematical modeling, real-time control, sensor integration, etc. Current work builds upon traditional areas of strength in artificial intelligence (i.e., knowledge representation, inferential reasoning, and parallel planning) through the application requirements of real-time decision making and on-line learning. DOE

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-18625 British Library Lending Div., Boston Spa (England).
SAMPLING ERRORS. THEY MAY DEPRIVE THE ANALYTICAL

RESULTS OF ANY MEANING
P. Gy 10 Sep. 1984 64 p refs Transl. into ENGLISH from Analusis (France), v. 11, no. 9, 1983 p p 413-440
(BLL-Mintek-Tr-1169-(5810.SF59)) Avail: British Library Lending Div., Boston Spa, England

It is pointed out that the sampling theory seems to be ignored by most official teaching and research bodies worldwide. In addition, it is argued that sampling is not a mere handling technique, but an error-generating operation. These errors add up to the analytical error, thus endangering the accuracy and reproducibility of the analytical results. It is shown how these errors are generated, how some of these can be cancelled, and how the others can be minimized and estimated. In their capacity as sample consumers, it is the analysts' duty to know and diffuse the sampling theory, as well as it should be their responsibility to take and prepare the samples. R.S.F.

N85-18626*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A 3-DIMENSIONAL MASS CONSERVING ELEMENT FOR COMPRESSIBLE FLOWS Final Report
George Fix (Carnegie-Mellon Univ., Pittsburgh) and Manil Suri (Maryland Univ., Baltimore County, Catonsville) Jan. 1985 29 p refs
(Contract NAS1-17070)
(NASA-CR-172513; ICASE-84-65; NAS 1.26:172513) Avail: NTIS HC A03/MF A01 CSCL 12A

A variety of finite element schemes has been used in the numerical approximation of compressible flows particularly in underwater acoustics. In many instances instabilities have been generated due to the lack of mass conservation. Two- and three-dimensional elements are developed which avoid these problems. B.W.

N85-18627*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WHERE ARE THE PARALLEL ALGORITHMS? Final Report
Robert G. Voigt Jan. 1985 16 p refs
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-172516; ICASE-85-2; NAS 1.26:172516) Avail: NTIS HC A02/MF A01 CSCL 12A

Four paradigms that can be useful in developing parallel algorithms are discussed. These include computational complexity analysis, changing the order of computation, asynchronous computation, and divide and conquer. Each is illustrated with an example from scientific computation, and it is shown that computational complexity must be used with great care or an inefficient algorithm may be selected. Author

N85-18628*# Hawaii Univ., Manoa. Dept. of Electrical Engineering.
ON THE BINARY WEIGHT DISTRIBUTION OF SOME REED-SOLOMON CODES
Shu Lin 22 Feb. 1985 13 p refs
(NASA-CR-174375; NAS 1.26:174375) Avail: NTIS HC A02/MF A01 CSCL 12A

Consider an (n,k) linear code with symbols from GF(2 sup M). If each code symbol is represented by a m-tuple over GF(2) using certain basis for GF(2 sup M), a binary (nm,km) linear code is obtained. The weight distribution of a binary linear code obtained in this manner is investigated. Weight enumerators for binary linear codes obtained from Reed-Solomon codes over GF(2 sup M) generated by polynomials, (X-alpha), (X-l)(X-alpha), (X-alpha)(X-alpha squared) and (X-l)(X-alpha)(X-alpha squared) and their extended codes are presented, where alpha is a primitive element of GF(2 sup M). Binary codes derived from Reed-Solomon codes are often used for correcting multiple bursts of errors. M.G.

N85-18629*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ON THE CONNECTION BETWEEN MULTIGRID AND CYCLIC REDUCTION
Marshal L. Merriam Sep. 1984 29 p refs
(NASA-TM-86020; A-9884; NAS 1.15:86020) Avail: NTIS HC A03/MF A01 CSCL 12A

A technique is shown whereby it is possible to relate a particular multigrid process to cyclic reduction using purely mathematical arguments. This technique suggest methods for solving Poisson's equation in 1-, 2-, or 3-dimensions with Dirichlet or Neumann boundary conditions. In one dimension the method is exact and, in fact, reduces to cyclic reduction. This provides a valuable reference point for understanding multigrid techniques. The particular multigrid process analyzed is referred to here as Approximate Cyclic Reduction (ACR) and is one of a class known as Multigrid Reduction methods in the literature. It involves one approximation with a known error term. It is possible to relate the error term in this approximation with certain eigenvector components of the error. These are sharply reduced in amplitude by classical relaxation techniques. The approximation can thus be made a very good one. Author

N85-18630# Loughborough Univ. of Technology (England). Dept. of Mathematics.
THE IMPLEMENTATION OF IRREGULAR GRID SYSTEMS FOR THE FINITE DIFFERENCE SOLUTION OF PARTIAL EQUATIONS
G. A. Evans Sep. 1984 39 p
(LU-Math-Res-181) Avail: NTIS HC A03/MF A01

A grind-generating process is described which allows for rapid alternations to grid patterns with minimum effort. The grid system provides for the finite difference solution of partial differential equations. A computer program is included herein. R.S.F.

N85-18631# Wisconsin Univ., Madison.
ON THE LOCAL BEHAVIOUR OF SOLUTIONS OF DEGENERATE PARABOLIC EQUATIONS WITH MEASURABLE COEFFICIENTS Technical Summary Report
E. DiBenedetto Sep. 1984 83 p
(Contract DAAG29-80-C-0041)
(AD-A147412; MRC-TSR-2745) Avail: NTIS HC A05/MF A01 CSCL 12/1

Locally bounded weak solutions of degenerate parabolic equations are proven to be locally hoelder continuous. Hoelder estimates are also derived up to the boundary for both Dirichlet data and (non-linear) variational data. Via a counterexample it is shown that non-negative solutions, in general, do not satisfy the parabolic version of the Harnack inequality. GRA

N85-18632# Stanford Univ., Calif. Lab. for Computational Statistics.
COMPUTING ENVIRONMENTS FOR DATA ANALYSIS. PART 1. INTRODUCTION
J. A. McDonald and J. Pedersen Apr. 1984 23 p
(Contracts N00014-83-K-0472; DAAG29-82-K-0056; Grant N00014-83-G-0121)
(AD-A148677; LCS-TR-9-Pt-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

Statistics has long been thought of as applied mathematics. Certain parts of it, especially data analysis, could easily be viewed as applied computation. In this context, different research issues assume importance, in particular, the design and implementation of computing environments for data analysis. Analyzing data requires computing, whether with paper-and-pencil or with a Cray super computer. The computing environment determines what sorts of statistical methods are practical. More importantly, the statistician's unconscious assumptions, or mental model of the computing environment determines the kinds of new statistical methods that are likely to be invented. Most current research in statistical computing is based on a batch processing model of computing environments that was appropriate twenty years ago. With a few exceptions, statisticians have not addressed the implications current and future developments in scientific computing environments. This paper is the first in a series that discuss local networks of graphics workstations as environments for statistical computing.

In this first part we provide general background and motivation. GRA

N85-18633# Stanford Univ., Calif. Lab. for Computational Statistics.
COMPUTING ENVIRONMENTS FOR DATA ANALYSIS. PART 2. HARDWARE
J. A. McDonald and J. Pedersen Apr. 1984 24 p
(Contracts N00014-83-K-0472; DAAG29-82-K-0056; Grant N00014-83-G-0121)
(AD-A148678; LCS-TR-10) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper is one of a series on aspects of modern computing environments that are relevant to statistical data analysis. We argue that a network of graphics workstations is a far superior to conventional batch or time-sharing computers as an environment for interactive data analysis. GRA

N85-18634# South Carolina Univ., Columbia. Dept. of Mathematics and Statistics.
SMALL-SAMPLE PROPERTIES OF KERNEL DENSITY ESTIMATORS FROM RANDOMLY RIGHT-CENSORED DATA
W. J. Padgett and D. T. McNichols (Virginia Polytechnic Inst. and State Univ., Blacksburg) Oct. 1984 34 p
(Grant AF-AFOSR-0156-84; AF Proj. 2304)
(AD-A148752; AFOSR-84-1153TR; TR-102; Rept-62G05-11) Avail: NTIS HC A03/MF A01 CSCL 12/1

The small-sample behavior of two kernel-type density estimators which have been proposed in the literature for randomly right-censored samples is investigated via Monte Carlo simulations. The extensive simulation study was performed for five families of life distributions, two different censoring distributions, three kernel functions, and several bandwidth sequences and for sample sizes from n=20 to n=300. The simulation results reinforce previous theoretical results for the estimators and lead to conjectures about their general behavior asymptotically as well as for small samples. A comparison of the two density estimators is also indicated. GRA

N85-18635# South Carolina Univ., Columbia. Dept of Mathematics and Statistics.
A KERNEL TYPE ESTIMATOR OF A QUANTILE FUNCTION FROM RIGHT-CENSORED DATA
W. J. Padgett Nov. 1984 25 p
(Grant AF-AFOSR-0156-84; AF Proj. 2304)
(AD-A148753; AFOSR-84-1150TR; TR-101; Rept-62G05-10) Avail: NTIS HC A02/MF A01 CSCL 12/1

Arbitrarily right-censored data arise naturally in industrial life testing and medical follow-up studies. In these situations it is important to be able to obtain nonparametric estimates of various characteristics of the survival function S. Based on such right-censored data, Kaplan and Meier gave the nonparametric maximum likelihood estimator of S, called the product-limit estimator, and , among others, Reid has proposed methods of estimating the median survival time from the product-limit estimator. Recently, Nair studied the problem of confidence bands for the survival function obtained from the product-limit estimator. Also, Padgett and McNichols and McNichols and Padgett have discussed estimation of a density for the survival distribution based on right-censored data. One characteristic of the survival distribution that is of interest is the quantile function, which is useful in reliability and medical studies. The quantile function of the product-limit estimator is a step function with jumps corresponding to the uncensored observations. The purpose of this paper is to present a smoothed nonparametric estimator of the quantile function from arbitrarily right-censored data based on the kernel method. It will be shown that under general conditions this estimator, mentioned briefly by Parzen is strongly consistent, and based on the results of a small Monte-Carol simulation study, performs better than quantile function of the product-limit estimator in the sense of smaller mean squared error. In particular, better estimates of the median survival time are obtainable. In addition, an approximation to the kernel estimator will be shown to be almost surely asymptotically equivalent to it under certain conditions. GRA

N85-18636# Columbia Univ., New York. Dept. of Applied Physics and Nuclear Engineering.
INVESTIGATION OF THREE-DIMENSIONAL MESH GENERATION WITH PRECISE CONTROLS Interim Scientific Report, 31 Oct. 1983 - 30 Sep. 1984
Peter R. Eiseman Oct. 1984 8 p
(Grant AF-AFOSR-0176-82; AF Proj. 2304)
(AD-A148759; AFOSR-84-1146TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During this period, the development of algebraic and adaptive grid techniques were continued and brought into a more refined state. Included were the topics of multisurface transformations together with Boolean operations, pointwise distributions on curves, two-dimensional surface grids embedded in three-dimensions, three-dimensional volume grids and the adaptive strategies of mean value relaxation, alternating direction, and center of mass relaxation for triangular meshes. Of paramount importance in the various adaptive strategies was the utilization of weighting functions, which was studied and still requires further development. Author (GRA)

N85-18637# Pacific Northwest Lab., Richland, Wash.
MODELS FOR MIXTURE EXPERIMENTS WHEN THE RESPONSE DEPENDS ON THE TOTAL AMOUNT
G. F. Piepel Aug. 1984 34 p refs Presented at the Ann. Meeting of the American Statistical Association (ASA), Philadelphia, 12 Aug. 1984
(Contract DE-AC06-76RL-01830)
(DE85-000370; PNL-SA-12461; CONF-840849-7) Avail: NTIS HC A03/MF A01

The usual definition of a mixture experiment requires that the response depend only on the proportions of the mixture components and not on the total amount of the mixture. Modified mixture models are considered that incorporate the total amount. Models in the individual component amounts are also considered and are compared to the modified mixture models. Examples are used to illustrate the development, interpretation, and comparison of the models. DOE

N85-18638# Oak Ridge Gaseous Diffusion Plant, Tenn.
SOLUTION OF THE h-EQUATION FOR A SINGLE POINT SOURCE EXCITATION OF MAGNITUDE K
R. O. Johnson Aug. 1985 46 p refs
(Contract DE-AC05-84OT-21400)
(DE84-017574; K/TS-10-885) Avail: NTIS HC A03/MF A01

An analytic solution to the equation 4A(sup 4)h(sub xx) + h(sub yy) = K delta(x-x*)delta(y-y*) is determined using standard methods for partial differential equations. Nonhomogeneous boundary conditions complicate the solution considerably. The actual boundary conditions employed include a linear temperature distribution along the centrifuge wall, constant end cap temperatures, and an upper atmosphere that is insulated. This solution can be used in conjunction with existing solutions to the Pancake equation to calculate primitive variables. DOE

N85-18639# Sandia Labs., Albuquerque, N. Mex.
FIXED VS. VARIABLE ORDER RUNGE-KUTTA
L. F. Shampine and L. S. Baca Jul. 1984 62 p refs
(Contract DE-AC04-76DP-00789)
(DE85-001320; SAND-84-1410) Avail: NTIS HC A04/MF A01

Popular codes for the numerical solution of non-stiff ordinary differential equations (ODEs) are based on a (fixed order) Runge-Kutta method, a variable order Adams method, or an extrapolation method. Extrapolation can be viewed as a variable order Runge-Kutta method. It is plausible that variation of order could lead to a much more efficient Runge-Kutta code, but numerical comparisons have been contradictory. Previous comparison are reconciled by exposing differences in testing methodology and incompatibilities of the implementations tested. An experimental Runge-Kutta code is compared to a state-of-the-art extrapolation code. With some qualifications, the extrapolation codes shows no

advantage. Extrapolation does not appear to be a particularly effective way to vary the order of Runge-Kutta methods. Although a good way to solve non-stiff problems, our tests raise the question as to whether there is any point to pursuing it as a separate method. DOE

N85-18640# Florida Univ., Gainesville. Dept. of Physic.
COMPUTING THE KAC DETERMINANT USING DUAL MODE TECHNIQUES AND MORE ABOUT THE NO-GHOST THEOREM
Charles B. Thorn 1984 35 p refs
(Contract DE-AS05-81ER-40008)
(DE85-001329; DOE/ER-40008/59) Avail: NTIS HC A03/MF A01

Some mathematical results concerning the Virasoro algebra are related to properties of dual models. Specifically, it is shown how to compute the Kac determinant using well-known techniques from dual models. The Kac formula is then used to discuss the validity of No-ghost theorem of dual models in a more general setting than the original proofs of that theorem. DOE

N85-18641# Fondazione Ugo Bordoni, Rome (Italy).
INITIALIZATION OF THOMPSON-PISARENKO'S ALGORITHM
Giuseppe Martinelli (Rome Univ.) and Gianni Orlandi (Rome Univ.)
Dec. 1983 9 p refs Sponsored by Ist. Superiore P.T.
(FUB-46-1983) Avail: NTIS HC A02/MF A01

The spectrum estimation of a process consisting of sinusoids in white noise by a gradient iterative algorithm is discussed. A very low convergence rate is avoided if the initial tap setting of the transversal filter estimator is chosen to be far from the eigenvectors of the covariance matrix of the process. An initial setting is suggested and is shown to be very effective in the case of two sinusoids. Author (ESA)

N85-18642# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
BOUNDARY CONDITIONS FOR ARTIFICIAL DISSIPATION OPERATORS
Lars-Erik Eriksson 17 Oct. 1984 40 p refs
(Contract FMV-F-K-82260-83-053-25-001)
(FFA-TN-1984-53) Avail: NTIS HC A03/MF A01

Boundary conditions for the most common second and fourth difference dissipation operators are analyzed in terms of their characteristic properties. Numerical experiments are performed to relate these properties to practical results. Generalized higher order operators with appropriate boundary conditions are also formulated so that any number of requirements can be met if necessary. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-18643# National Aerospace Lab., Tokyo (Japan).
MONTE CARLO SIMULATION OF ELECTRON THERMALIZATION IN RARE GASES
Katsuhisa Koura Sep. 1984 10 p refs
(NAL-TR-834T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The Monte Carlo simulation (MCS) of the thermalization of subexcitation electrons in rare gases is performed for the hard-sphere and Maxwell models gases. The MCS result for the mass ratio m/M approx. < 0.01 agrees within the statistical error with the rigorous solution of the Fokker-Planck equation; therefore the upper limit value of $m/M=0.01$ is sufficient for the MCS to be performed within a reasonable computation time. In the hard-sphere gas, the electron velocity distribution deviates significantly from the local Maxwell distribution (MD) even for the initial Maxwell distribution; therefore the thermalization time, which is nearly independent of the initial electron velocity distribution, is about 30% larger than that obtained by the approximate theory based on the MD assumption. The MCS results obtained with $m/M=0.01$ for He, Ne, Ar, Kr, and Xe agree within the statistical error with the (rigorous) results obtained by Shizgal and McMahon using the discrete ordinate method. M.G.

N85-18644# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.
ESTIMATING THE SCALE PARAMETER OF AN EXPONENTIAL DISTRIBUTION FROM A SAMPLE OF TIME-CENSORED r-th ORDER STATISTICS
Shelemyahu Zacks (State Univ. of New York, Binghamton) 9 Oct. 1984 33 p
(Contract N00014-83-K-0216)
(AD-A148060; GWU/IMSE/SERIAL-T-495/84) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of estimating the mean, theta, of an exponential distribution is studied, when the data available are a random sample of time-censored r-th order statistics. Examples for such empirical situations are cited in the paper. Maximum Likelihood (MLE) and Moment Equation (MEE) estimators are studied. Theoretical derivations are provided for the large sample variances and distributions of these estimators. The efficiency of the MEE compared to the MLE is studied. Author (GRA)

N85-18645# South Carolina Univ., Columbia. Dept of Mathematics and Statistics.
EXACT SIMULTANEOUS CONFIDENCE INTERVALS FOR PAIRWISE COMPARISONS OF THREE NORMAL MEANS
John D. Spurrier and Steven P. Isham Oct. 1984 21 p
(Grant AF-AFOSR-0156-84; AF Proj. 2304)
(AD-A148751; AFOSR-84-1154TR; SCU-STAT-94R) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of simultaneously estimating the pairwise differences of means of three independent normal populations with equal variances is considered. A computational method involving a bivariate t density is used to form confidence intervals with simultaneous coverage probability equal to 1 alpha. For equal sample sizes, the method is the Tukey studentized range procedure. With unequal sample sizes, the method is superior to the various generalized Tukey methods. A table of probability points is presented for small sample sizes. A large sample approximation based on the bivariate normal and the studentized range distributions is given. GRA

N85-18646# Stanford Univ., Calif. Lab. for Computational Statistics.
PRINCIPAL CURVES AND SURFACES
T. Hastie Nov. 1984 107 p
(Contracts N00014-83-K-0472; N00014-81-K-0340; DE-AC03-76SF-00515; DE-AT03-81ER-10843; DAAG29-82-K-0056)
(AD-A148833; SU-LCS-TR-11) Avail: NTIS HC A06/MF A01 CSCL 12/1

Principal curves are smooth one dimensional curves that pass through the middle of a p dimensional data set. They minimize the distance from the points, and provide a non-linear summary of the data. The curves are non-parametric and their shape is suggested by the data. Similarly, principal surfaces are two dimensional surfaces that pass through the middle of the data. The curves and surfaces are found using an iterative procedure which starts with a liner summary such as the usual principal component line or plate. Each successive iteration is a smooth or local average of the p dimensional points, where local is based on the projections of the points onto the curve or surface of the previous iteration. A number of linear techniques, such as factor analysis and errors in variables regression, end up using the principal components as their estimates (after a suitable scaling of the co-ordinates). Principal curves and surfaces can be viewed as the estimates of non-linear generalizations of these procedures. Principal Curves (or surfaces) have a theortical definition for distributions: they are the Self Consistent curves. A curve is self consistent if each point on the curve is the conditional mean of the points that project there. The main theorem proves that principal curves are critical values of the expected squared distance between the points and the curve. Linear principal components have this

property as well; in fact, we prove that if a principal curve is straight, then it is a principal component. These results generalize the usual duality between conditional expectation and distance minimization. We also examine two sources of bias in the procedures, which have the satisfactory property of partially cancelling each other. GRA

N85-18647# Princeton Univ., N. J. Dept. of Statistics.
SIMPLE APPROXIMATE VARIANCES FOR b-LETTER VALUES. A SAMPLING ENQUIRY: SUPPLEMENT
Carlos Mendoza and John W. Tukey Jun. 1984 32 p ref
(Contract DE-AC02-81ER-10841)
(DE85-001410; DOE/ER-10841/13; TR-269-SER-2) Avail: NTIS HC A03/MF A01

Estimates of the variance of certain linear combinations of order statistics (b-letter values) are proposed. The estimates are nonparametric and are quadratic forms in some order statistics. A heuristic justification of these estimates is provided. The performance of the estimates is judged from two sampling experiments. From the experiments the estimates are found to have a very modest bias and to adapt well to several sampling paradigms. DOE

N85-18648# Harvard Univ., Cambridge, Mass. Museum of Comparative Zoology.
STUDY OF MATHEMATICAL MODELS OF MUTATION AND SELECTION IN MULTI-LOCUS SYSTEMS Comprehensive Progress Report, 1 Jan. 1982 - 1 Sep. 1984
R. C. Lewontin 1984 19 p refs
(Contract DE-AC02-76EV-02472)
(DE85-000873; DOE/EV-02472/T2) Avail: NTIS HC A02/MF A01

The first topic addressed is asymmetric models of selection and linkage. This was investigated by considering only 2 loci with 2 alleles. The general 8 parameter system was investigated for restricted symmetrical models with four or fewer parameters. The general conclusions of the work on these special models is that unless linkage is fairly tight or epistatic interactions fairly strong, the linkage balance equilibria will be stable and will be the most commonly observed situation in natural populations. The second topic addressed was selection for and against fitness instability. The question was asked whether a mutation whose demographic parameters are less sensitive to environmental fluctuation than the wild type will succeed in entering a population living in a fluctuation auto-correlated environment. It was shown that the behavior of a mutation in a population depends upon the steady state growth rates of the homozygotes and heterozgotes which in turn depend upon the Leslie matrices of age-specific fertility and survivorship in different environments. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-18649*# Informatics, Inc., Palo Alto, Calif.
VECTOR COMPUTER MEMORY BANK CONTENTION
David H. Bailey Feb. 1985 16 p refs
(Contract NAS2-11555)
(NASA-CR-177342; NAS 1.26:177342) Avail: NTIS HC A02/MF A01 CSCL 12B

A number of vector supercomputers feature very large memories. Unfortunately the large capacity memory chips that are used in these computers are much slower than the fast central processing unit (CPU) circuitry. As a result, memory bank reservation times (in CPU ticks) are much longer than on previous generations of computers. A consequence of these long reservation times is that memory bank contention is sharply increased, resulting in significantly lowered performance rates. The phenomenon of memory bank contention in vector computers is analyzed using both a Markov chain model and a Monte Carlo simulation program. The results of this analysis indicate that future generations of supercomputers must either employ much faster memory chips or else feature very large numbers of independent memory banks. M.G.

N85-18650# Harris (Carl M.) and Associates, Charlottesville, Va.
ISSUES IN SENSITIVITY AND STATISTICAL ANALYSIS OF LARGE-SCALE, COMPUTER-BASED MODELS Final Report
Carl M. Harris Aug. 1984 41 p refs Sponsored in part by Federal Emergency Management Agency
(PB85-116317/GAR; NBS/GCR-84-466) Avail: NTIS HC A03/MF A01 CSCL 12B

Theoretical and practical considerations associated with the use of sensitivity analysis in model evaluation are addressed. Special attention is paid to uses of sensitivity analysis to determine the rates of output change with respect to changes in the inputs, importance ranking of the inputs from a sensitivity viewpoint, and assessment of output variability attributable to the inputs. One of the natural consequences of such statistical quantification of the variability of the model's outputs is the development of tools useful for the decision maker in employing the target model in the analysis of measures for dealing with an uncertain environment. Two analysis techniques, model sampling and response surface analysis, are described in the report. Illustrations are provided to demonstrate how one would apply each of the techniques as an integral part of a model evaluation. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-18651*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHANDRASEKHAR EQUATIONS FOR INFINITE DIMENSIONAL SYSTEMS Final Report
Kazufumi Ito (Brown Univ., Providence, R. I.) and Robert K. Powers Jan. 1985 38 p refs Submitted for publication
(Contract NAS1-17070)
(NASA-CR-172515; ICASE-84-67; NAS 1.26:172515) Avail: NTIS HC A03/MF A01 CSCL 12A

Chandrasekhar equations are derived for linear time invariant systems defined on Hilbert spaces using a functional analytic technique. An important consequence of this is that the solution to the evolutional Riccati equation is strongly differentiable in time and one can define a strong solution of the Riccati differential equation. A detailed discussion on the linear quadratic optimal control problem for hereditary differential systems is also included. B.W.

N85-18652# Stanford Univ., Calif. Systems Optimization Lab.
GENERALIZED CONVEX FUNCTIONS: PROPERTIES, OPTIMALITY AND DUALITY
R. N. Kaul and S. Kaur Aug. 1984 26 p refs
(Contract DE-AT03-76ER-72018)
(DE85-001553; SU-SOL-84-4) Avail: NTIS HC A03/MF A01

It is shown that a set which is closed and locally star shaped at each of its points is convex. Moreover, a semilocally convex function on a closed set which is also lower semi-continuous is a convex function. A characterization is given for a function to be semilocally convex. For a nonlinear programming problem involving semilocally convex functions, a dual is associated and necessary optimality conditions are derived. DOE

N85-18653# Bonn Univ. (West Germany). Inst. fuer Physikalische.
NICOLAI MAPS AND STOCHASTIC OBSERVABLES FROM A COUPLING CONSTANT FLOW
K. Dietz and O. Lechtenfeld Oct. 1984 20 p refs
(BONN-HE-84-26; ISSN-0172-8733) Avail: NTIS HC A02/MF A01

Coupling constant flow equations are derived for supersymmetric scalar and gauge theories. These equations serve as a

starting point for the construction of Nicolai maps. From the fixed-point properties of the maps, a large class of stochastic functionals is established. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-18654# Colorado Univ., Boulder.
LIGHT SCATTERING STUDIES OF LOWER DIMENSIONAL COLLOIDAL PARTICLE AND CRITICAL FLUID SYSTEMS
W. J. OSullivan and R. C. Mockler Sep. 1984 16 p refs
(Contract DE-AC02-82ER-13004)
(DE85-002087; DOE/ER-13004/2) Avail: NTIS HC A02/MF A01

The response to compression of colloidal particle crystals in monolayers on the surface of water was studied. The crystals deform elastically as the crystals are compressed in a Langmuir trough from a lattice spacing of ten microns to spacings less than two microns. A phase transition to a close packed triangular lattice phase occurs at very high densities, when the attractive van der Waals/steric interactions between particles dominate. The authors have found that the aggregates formed, when a colloidal particle monolayer coagulates following switching off of the repulsive electric dipole interactions, show scale invariance with a fractal dimension consistent with the prediction of a theory of diffusion limited aggregation in two dimensions. Stable black bilipid membranes have been produced, both spherical and planar, with and without embedded microparticles. The preliminary results indicate that the film dynamical response remains that of an equivalent three dimensional system, in apparent disagreement with recent theoretical predictions of Calvo and Ferrell. DOE

N85-18655# Los Alamos Scientific Lab., N. Mex.
NEW PHASES AND CHEMICAL REACTIONS IN SOLID CO UNDER PRESSURE
R. L. Mills, D. Schiferl, A. I. Katz, and B. W. Olinger 1984 6 p refs Presented at the Intern. Colloq. on the Phys. and Physicochem. of Highly Condensed Matter, Auossis, France, 11 Sep. 1984
(Contract W-7405-eng-36)
(DE85-002033; LA-UR-84-2994; CONF-8409145-1) Avail: NTIS HC A02/MF A01

The phase diagram of solic carbon monoxide was determined by X-ray diffraction and Raman spectroscopy from 15 to 297 K at pressure from 1.0 to 10.0 GPa. At low temperature a transition occurs near 3.4 GPa from the known ALPHA-phase (space group P213) to a new epsilon-phase (structure unknown), rather than to the predicted GAMMA-phase (P4 sub 2 mnm). A transformation from BETA-CO (space group P63/mmc) into a new delta-phase (Pm3n) was found near 5.2 GPa at room temperature. Above about 4.6 GPa and 80 K, CO reacts photochemically when irradiated with visible laser light. The photoreactivity may be associated with the formation of a yellow polymer, which can be recovered at zero pressure. ESCA measurements indicate that the polymer is composed of carbon suboxide (C3O2) sub x/. DOE

N85-18656# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
FERROMAGNETISM IN METALS AT FINITE TEMPERATURES
B. L. Gyorffy (Bristol Univ., England), J. B. Staunton, and G. M. Stocks (Imperial College of Science and Technology, London) 1984 16 p refs Presented at the High-Temperature Alloys: Theory and Design Conf., Bethesda, Md., 8 Apr. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000898; CONF-840417-5) Avail: NTIS HC A02/MF A01

The conventional spin-polarized band theory is well known to give a reasonable description of the magnetic ground states of metals. Here it is generalized to finite temperatures. The resulting theory is the first first-principles theory of the ferromagnetic phase transition in metals. It is a mean-field theory. For iron T/sub c/ = 1250 K and chi(-1) (q = 0) follows a Curie-Weiss law. Results for the wave-vector dependent susceptibility chi(q) which is a measure of magnetic short-range order above T/sub c/ are also reported. DOE

N85-18657# Tennessee Univ., Knoxville. Dept. of Physics.
MAGNETISM OF CALIFORNIUM METAL
S. E. Nave, J. R. Moore, M. T. Spaar, R. G. Haire, and Paul G. Huray (ORNL) 1984 8 p refs Presented at the EPS Top. Conf. on Electronic Structure and Properties of Rare Earth and Actinide Intermetallics, St. Polten, Austria, 3 Sep. 1984
(Contract DE-AC05-84OR-21400; DE-AS05-79ER-10348)
(DE85-001141; CONF-8409102-4) Avail: NTIS HC A02/MF A01

Magnetic susceptibility was measured on samples of californium-249 metal having the dhcp crystal structure. At temperatures between 100K and 300K and at fields up to 50 kilogauss, the samples exhibit Curie-Weiss behavior with 3 samples giving a magnetic moment per atom of (MU)/sub eff/ = 10.6 + or - 0.2 (MU)/sub B/ and paramagnetic Weiss temperatures, theta/sub p/, in the range of -2K to -41K. These values of (MU)/sub eff/ are in good agreement with the value expected (10.62(MU)/sub B/) for a free ion 5f(9) configuration based on an L-S coupling scheme and Hund's Rule. A fourth sample gives the values (MU)/sub eff/ = 9.7 + or - 0.2(MU)/sub B/ and theta/sub p/ = -41K. At low temperatures the samples exhibit an ordered magnetic transition to a state with a saturated moment of 6.1 (MU)/sub B//atom when extrapolated to infinitely high field. The low temperature ordered phase exists at temperatures below T/sub c/ = 51 + or - 2K as determined from constant magnetization plots. DOE

N85-18658# California Univ., Livermore. Lawrence Livermore Lab.
MATERIALS PHYSICS Quarterly Report, Jan. - Mar. 1984
J. A. Moriarty, ed. 31 Aug. 1984 51 p refs
(Contract W-7405-eng-48)
(DE84-017103; UCID-18574-84-1) Avail: NTIS HC A04/MF A01

Topics studied included: measurement of the temperature of the stationary arc in the H Division railgun; silica at ultrahigh temperature and expanded volume; variational fluid theory with inverse twelfth power reference potential; a model for L-shell transitions of N, O, and F-Like Ar ions; modeling neon-like selenium; theoretical instabilities in large deformation simple shear loading; and new theoretical EOS of PBX9404. DOE

N85-18659# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
4 Feb. 1985 61 p refs Transl. into ENGLISH of various East German, Czechoslovakian, and Hungarian articles
(JPRS-ESA-85-005) Avail: NTIS HC A04/MF A01

Semiconductors, computer equipment, measurement devices, and data acquisition techniques displayed at the 1984 Leipzig Spring Fair are described. The development of optoelectronic components for machine control in Czechoslovakia, and regulations for technology development financing and problems of the electronics industry in Hungary are reported. For individual titles, see N85-18660 through N85-18662.

N85-18660# Joint Publications Research Service, Arlington, Va.
SEMICONDUCTORS AT LEIPZIG SPRING FAIR c76
A. Blodszun and W. E. Schlegel *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-005) 4 Feb. 1985 p 1-13 Transl. into ENGLISH from Radio Fernsehen Elektron. (East Berlin), v. 33, no. 6, Jun. 1984 p 344-348 (For primary document see N85-18659 09-70)
Avail: NTIS HC A04/MF A01

Integrated circuits, optoelectronics, and passive electronic components exhibited include: an FM-ZF amplifier with demodulator for use with ceramic filters; a Si-npn Darlington transistor for electronic ignitions systems; 8 bit single chip microcomputers; GaAs IR emitter diodes for infrared remote control units and for optical transmission systems; LEDs for display color combinations; 4 K bit static RAMs with selectable access; microcomputer systems; a monolithic Hall generator; a sensor and control component for

steady and alternating magnetic fields; circuits for scientific pocket calculators and watches; MOS-LSI gate array systems; ceramic wafer, aluminum electrolytic, and tantalum bead capacitors; metal and rotary film resistors; medium load potentiometers; and micromotors with electronic commutation and rpm control. A.R.H.

N85-18661# Joint Publications Research Service, Arlington, Va.
DATA ACQUISITION, MEASUREMENT DEVICES AT 1984 LEIPZIG SPRING FAIR c60
K. Eckert, G. Raab, and B. Kasper *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-005) 4 Feb. 1985 p 14-31 Transl. into ENGLISH from Radio Fernsehen Elektron. (East Berlin), v. 33, no. 6, Jun. 1984 p 355-363 (For primary document see N85-18659 09-70)
Avail: NTIS HC A04/MF A01

Applications of microcomputer technology to electronic instrumentation are described as well as an ultrasonic unit for testing components. Programmable voltmeters; logic analyzers; oscilloscopes; and pulse, signal, and video function generators for troubleshooting, adjusting, and checking out equipment are discussed. A high fidelity, electro-optical converter is also analyzed. A.R.H.

N85-18662# Joint Publications Research Service, Arlington, Va.
COMPUTER EQUIPMENT AT 1984 LEIPZIG SPRING FAIR c60
V. Loeschner and B. Kasper *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-005) 4 Feb. 1985 p 32-39 Transl. into ENGLISH from Radio Fernsehen Elektron. (East Berlin), v. 33, no. 7, Jul. 1984 p 430-463 (For primary document see N85-18659 09-70)
Avail: NTIS HC A04/MF A01

Data processing equipment demonstrated include: a small scientific and technology computer which automates the conversion of mensuration units; a single board microcomputer designed to aid in understanding and programming the U 880; and electronic invoicing and bookkeeping machine; and digitized work stations. Dot matrix as well as thermal, nonmechanical, and alphanumeric printers were exhibited. Digital data display units with swiveling screen and keyboard with adjustable tilt angle were also displayed. A.R.H.

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-18663*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE INTERACTION OF A SOUND PULSE WITH THE SHEAR LAYER OF AN AXISYMMETRIC JET. PART 3: NONLINEAR EFFECTS Final Report
Alvin Bayliss (Exxon Corp. Research, Clinton, N.J.), Lucio Maestrello, and Eli Turkel (Tel Aviv Univ., Israel) Jan. 1985 24 p refs (Contracts NAS1-15810; NAS1-16394; NAS1-17130; NAS1-17170)
(NASA-CR-172512; ICASE-84-61; NAS 1.26:172512) Avail: NTIS HC A02/MF A01 CSCL 20A

The fluctuating field of a jet excited by transient mass injection is simulated numerically. The model is developed by expanding the state vector as a mean state plus a fluctuating state. Nonlinear terms are not neglected, and the effect of nonlinearity was studied. A high order numerical method is used to compute the solution. The results show a significant spectral broadening in the flow field due to the nonlinearity. In addition, large scale structures are broken down into smaller scales. Author

N85-18664# Pacific Northwest Lab., Richland, Wash.
EMERGING TECHNOLOGY OF SYNTHETIC APERTURE FOCUSING FOR ULTRASONIC TESTING
L. J. Busse, S. R. Doctor, and H. D. Collins Jun. 1984 7 p refs Presented at the ASME Pressure Vessel and Piping Conf., San Antonio, 17 Jun. 1984
(Contract DE-AC06-76RL-01830)
(DE85-000373; PNL-SA-11947) Avail: NTIS HC A02/MF A01

The capabilities of synthetic aperture focusing techniques for ultrasonic testing (SAFT-UT) as a nondestructive testing technique are presented. SAFT-UT is a digital ultrasonic imaging method, which can be adapted to many different materials, specimen geometries, and wave propagation modes. The process allows each point within the inspected volume to be focused upon by mathematically simulating the action of a lens, specifically formed for imaging that point in the volume. All points are therefore imaged at the maximum available resolution. The PNL effort in SAFT-UT is a continuation of a program started earlier by the NRC at the University of Michigan. The objectives of the present program are: (1) to engineer and evaluate a real-time flaw detection and imaging system based on SAFT-UT for inservice inspection of all required LWR components; (2) to establish calibration and field test procedures; (3) to demonstrate and validate the system through field reactor inspections, and (4) to gain ASME Code acceptance of the real-time SAFT-UT technique. DOE

N85-18665# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
ACOUSTIC IMAGING IN A WATER FILLED METALLIC PIPE
William F. Kolbe, Bojan T. Turko, and Branko Leskovar Apr. 1984 11 p refs Presented at the Nucl. Sci. Symp., Orlando, Fla., 31 Oct. - 2 Nov. 1984
(Contract DE-AC03-76SF-00098)
(DE84-016051; LBL-17697; CONF-841007-4) Avail: NTIS HC A02/MF A01

A method is described for imaging the interior of a water filled metallic pipe using acoustical techniques. The apparatus consists of an array of 20 acoustic transducers mounted circumferentially around the pipe. Each transducer is pulsed in sequence, and the echos resulting from bubbles in the interior are digitized and processed by a computer to generate an image. The electronic control and digitizing system and the software processing of the echo signals are described. The performance of the apparatus is illustrated by the imaging of simulated bubbles consisting of thin walled glass spheres suspended in the pipe. DOE

N85-18666# California Univ., Livermore. Lawrence Livermore Lab.
ACOUSTIC TOMOGRAPHIC RECONSTRUTION OF ANOMALIES IN THREE-DIMENSIONAL BODIES
R. M. Bevensee Aug. 1984 8 p refs Presented at the Progress in Quantitative NDE, San Diego, Calif., 8-13 Jul. 1984
(Contract W-7405-eng-48)
(DE84-017035; UCRL-91422; CONF-840738-4) Avail: NTIS HC A02/MF A01

Acoustic tomography based on data processing shear wave scattered field over an observational plane, including frequency and polarization diversities is presented. The theory is based on the Gubernatis formulation of scattering and does not require solution of the Fredholm equation for material displacement. An essential feature of the theory is an expansion of v/sub jk/u/sub k/ in even powers of frequency to obtain an equivalent frequency insensitive source in the anomaly. Data inversion is treated both in Cartesian coordinates via the two dimensional fast Fourier transform (FFT) and in cylindrical coordinates via the one dimensional Hankel transform. The advantages of polarization diversity are noted and sampling formulae are quoted. AR (auto regressive) and ARMA (auto regressive moving average) modeling are mentioned as means of improving anomaly resolution. Both frequency and polarization diversities tend to reduce speckle noise. DOE

N85-18667# European Space Agency, Paris (France).
CONTRIBUTION OF THE STUDY OF LIGHT AIRCRAFT PROPELLER NOISE
Helene Gounet Sep. 1984 169 p refs Transl. into ENGLISH of "Contrib. a l'Etude du Bruit des Helices d'Avions Legers" Rept. ONERA-NT-1982-8 ONERA, Paris, 1982 Original language document announced as N84-26386

(ESA-TT-865; ONERA-NT-1982-8) Avail: NTIS HC A08/MF A01

A propeller noise prediction program was developed; a numerical application was made to determine the parameters acting on the tone acoustic level. The emitted noise is essentially caused by the mean load on the blades and the tip rotation Mach number is the major parameter of the acoustic emission. Results are confirmed by flight measurements. An assessment method for the acoustic field emitted by a propeller derived from charts was reviewed to determine its ability to predict light aircraft propeller noise. In order to predict perceived acoustic levels under acoustic certification conditions for light aircraft, ground reflection phenomena of sound waves were studied and incorporated in the computation model. Author (ESA)

N85-18668# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.

A PRELIMINARY ASSESSMENT OF ENVIRONMENTAL NOISE FROM LARGE WIND ENERGY CONVERSION SYSTEMS (WECS) BASED ON EXPERIENCES FROM SWEDISH PROTOTYPES

Sten Ljunggren Oct. 1984 51 p refs

(Contract STEV-506-101-7)

(FFA-TN-1984-48) Avail: NTIS HC A04/MF A01

Noise at Swedish 3 and 2 MW wind energy converters was measured. It is shown that the noise levels are close to those measured at similar units in the United States, and that the radiation is uniform in the vertical and horizontal plane. A comparatively large distance (800 to 2500 m) is needed between the prototypes and residential locations if the same basis for forming a judgement is used as for industrial noise. With suitable measures (sound insulation of machinery housing, increased cut-in wind speed, variable rotational speed of turbine) the distance for an upwind unit is reduced to 300 to 500 m, provided the masking effect of natural wind sound is taken into account. Author (ESA)

N85-18669# European Space Agency, Paris (France).

COMPUTATION OF NOISE RADIATION FROM A FREE JET PERPENDICULAR TO ITS AXIS VIA LASER ANEMOMETRY MEASUREMENTS

Jean Maulard and Georges Elias Oct. 1984 64 p refs Transl. into ENGLISH of "Calcul du Bruit Rayonne par un Jet Libre Perpendiculairement a son Axe Laser" Rept. ONERA-NT-1983-6 ONERA, Paris, 1983 Original language document announced as N84-26387

(ESA-TT-870; ONERA-NT-1983-6) Avail: NTIS HC A04/MF A01

A model for the acoustic radiation of a cylindrical free jet in a direction perpendicular to its axis of symmetry based on Lighthill's equation is presented. Aerodynamic parameters related to the power spectral densities associated with fluctuations of the velocity component perpendicular to the jet axis and fluctuations of the squared value of the velocity component were measured by laser anemometry and are expressed by an empirical formula which covers all the results obtained in the effective acoustic field of the jet. The theoretical expression of the radiated acoustic field derived from the model and including the measured aerodynamic parameters was computed. This expression does not rely on any empirical coefficient to match the calculated values and the acoustic measurements. For cold and hot sub and supersonic jets, good agreement is achieved between theory and experiment for the overall acoustic field and its power spectra density. Author (ESA)

N85-18362# Leeds Univ. (England). Dept. of Applied Mathematical Studies.

SOUND TRANSMISSION IN DUCTS

N. Romilly *In* Shock and Vibration Information Center The Shock and Vibration Digest, V. 16, No. 10 Oct. 1984 p 3-7 refs (For primary document see N85-18361 09-39)

Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/1

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-18670*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EXPERIMENTAL DETERMINATION OF THE 1 SIGMA(+) STATE ELECTRON-DIPOLE-MOMENT FUNCTION OF CARBON MONOXIDE UP TO A LARGE INTERNUCLEAR SEPARATION

C. Chackerian, Jr., R. Farreng, G. Guelachvil', C. Rossetti (Paris Univ., Orsay, France), and W. Urban (Bonn Univ., West Ger.) Jun. 1984 21 p refs

(NASA-TM-85979; A-9810; NAS 1.15:85979) Avail: NTIS HC A02/MF A01 CSCL 20H

Experimental intensity information is combined with numerically obtained vibrational wave functions in a nonlinear least squares fitting procedure to obtain the ground electronic state electric-dipole-moment function of carbon monoxide valid in the range of nuclear oscillation (0.87 to 1.01 A) of about the V = 38th vibrational level. Mechanical anharmonicity intensity factors, H, are computed from this function for delta V + = 1, 2, 3, with < or = to 38. Author

N85-18671# Colorado State Univ., Fort Collins. Dept. of Chemistry.

SUPERSONIC MOLECULAR JET STUDY OF THE LIQUID STATE Final Report, 1 Sep. 1981 - 31 Jul. 1984

E. R. Bernstein 10 Oct. 1984 10 p

(Contract MIPR-144-83)

(AD-A147416; ARO-18194.3-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

The study of solvation of aromatic molecules (benzene, toluene, aniline) by small hydrocarbone (CnH2n+2, n = 2,3) in a molecular jet is discussed. The detection of the clusters is through laser induced fluorescence and time of flight mass spectroscopy. The clusters observed (up to 15 solvent molecules) are compared to liquid state systems; simple atom-atom potential calculations are employed to help assign geometry. Dynamical behavior of the clusters is characterized in terms of intramolecular vibrational redistribution, vibrational dissociation, and vibrational energy transfer. Author (GRA)

N85-18672# Vanderbilt Univ., Nashville, Tenn. Dept. of Computer Science.

AN EXTENSION OF THE MULTICONFIGURATION HARTREE-FOCK PROGRAM FOR CONTINUUM FUNCTIONS

Charlotte Froese Fischer and Hari P. Saha 1984 20 p refs

(Contract DE-AS05-80ER-10618)

(DE85-002080; DOE/ER-10618/12) Avail: NTIS HC A02/MF A01

The wave function of an outer electron coupled to a core, possibly with correlation included in the core, is similar to a multiconfiguration Hartree-Fock (MCHF) wavefunction, except that the radial function of the electron is a continuum functions, and different numerical procedures are required for determining it. Only a single continuum function is allowed, and the orbitals defining the wave function of the core and bound channels are assumed to be fixed. The coefficients in the expansion of the wave function of the core are also fixed and are the result of a bound state calculation for the core. Under these assumptions, the equation for the radial wave function of the electron is solved iteratively. The asymptotic phase shift is evaluated. In order to test the accuracy of the procedure, calculations were performed for the scattering of electrons by neutral hydrogen. Some results of a photoionization calculation are compared, and for an electron transition in nitrogen. DOE

N85-18673# California Univ., Berkeley. Lawrence Berkeley Lab.

EFFECT OF RESONANT MICROWAVE POWER ON A PIG ION SOURCE

I. G. Brown, J. E. Galvin, B. F. Gavin, and R. A. Macgill Aug. 1984 15 p refs

(Contract DE-AC03-76SF-00098)

(DE85-001396; LBL-17827) Avail: NTIS HC A02/MF A01

The effect of applying microwave power at the electron cyclotron frequency on the characteristics of the ion beam extracted from a hot-cathode Penning ionization gauge (PIG) ion source was investigated. No change was seen in the ion charge state distribution. A small but significant reduction in the beam noise level was seen, and it is possible that the technique may find application in situations where beam quiescence is important.DOE

N85-18674# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Ceramics.

METAL ATOM DIFFUSION IN AMORPHOUS SILICA AND AT THE SILICA SURFACE Final Report

S. H. Garofalini 14 May 1984 12 p

(Contract DE-AS05-82ER-12094)

(DE84-017351; DOE/ER-12094/T2) Avail: NTIS HC A02/MF A01

EXAFS evidence was obtained indicating that Zn becomes octahedrally coordinated in zinc-silicate systems containing sodium. Simulations of atomic oxygen on the PT(111) surface were used to establish the PT-O interaction potential to be incorporated in the work of Pt on the vitreous silica surface. Molecular dynamics simulations of Pt adatoms on the vitreous-SiO2 surface reproduce the EXAFS bond lengths and coordination numbers in the literature. (DLC) DOE

N85-18675# Chicago Univ., Ill.

BASIC STUDIES OF ATOMIC DYNAMICS Progress Report, 1 Sep. 1983 - 31 Jul. 1984

U. Fano 31 Jul. 1984 14 p refs

(Contract DE-AC02-76ER-01674)

(DE84-015661; DOE/ER-01674/1) Avail: NTIS HC A02/MF A01

The approach to the Zeeman effect of Rydberg electrons introduced in the proposal for 1984 has yielded important qualitative results and conclusions, leading to the design of a broader and more detailed procedure described in the accompanying proposal. A new technique for studying electron correlations in open valence sheels has proved very successful in applications to Be and Mg, yielding unexpected insights; it is now being extended to Al. The study of correlations originating at high electron density has lead to an initial publication and is approaching completion. DOE

N85-18676# Argonne National Lab., Ill.

NOTES FOR LECTURES IN CHINA: THE BETHE THEORY OF INELASTIC COLLISIONS OF FAST CHARGED PARTICLES WITH ATOMS AND MOLECULES

M. Inokuti 1984 27 p

(Contract W-31-109-eng-38)

(DE84-017487; DOE/NBM-4017487) Avail: NTIS HC A03/MF A01

Topics covered include: the 1930 paper of Bethe and its importance; differential cross sections; generalized oscillator strength, the Bethe surface; integrated cross sections; and generalizations. DOE

N85-18677# Argonne National Lab., Ill.

ALIGNMENT OF HIGH RYBERG STATES IN HYDROGEN

H. G. Berry, J. C. DeHaes, D. K. Neek, and L. P. Somerville 1984 8 p refs Presented at Symp. on the Phys. of electron Ejection in Ion-atom and Ion-solid Collisions, Aarhus, Denmark, 29 Jun. 1984

(Contract W-31-109-eng-38)

(DE85-000582; CONF-8406206-3) Avail: NTIS HC A02/MF A01

The light yields and polarizations of the light emitted from several Blamer transitions in atomic hydrogen following beam foil excitation of protons at energies of 50 to 150 keV were measured. The polarizations were measured as a function of distance downbeam from the exciter foil for several transitions. The measurements indicate a very strong initial alignment which is then perturbed by surface fields out to several mm from the surface. DOE

N85-18678# Oak Ridge National Lab., Tenn.

MULTIPHOTON IONIZATION OF ATOMIC CESIUM

R. N. Compton, C. E. Klots, J. A. D. Stockdale, and C. D. Cooper (Georgia Univ., Athens) 1984 14 p refs Presented at the 2nd Topical Meeting on Laser Tech. in the Extreme Ultraviolet, Boulder, Colo., 5 Mar. 1984

(DE85-001266; CONF-840387-13) Avail: NTIS HC A02/MF A01

The resonantly enhanced multiphoton ionization (MPI) of cesium atoms was studied in the presence and absence of an external electric field. In the zero field studies, photoelectron angular distributions for one and two photon resonantly enhanced MPI are compared with the theory of Tang and Lambropoulos. In the absence of an external electric field, signal due to two photon resonant three photon ionization of cesium via up states is undetectable. Application of an electric field mixes nearby nd and ns levels, induces excitation and subsequent ionization. Signal due to two photon excitation of ns levels in field free experiments is weak due to small photoionization cross section. An electric field mixes nearby np levels which again allows detectable photoionization signal. For both ns and np states, the field induced MPI signal increases as the square of the electric field for a given principal quantum number and increases rapidly with n for a given field strength. The two photon field ionization threshold is lower for the case in which the laser polarization and the electric field are parallel than it is when they are perpendicular. Dissert. Abstr.

N85-18679# Fermi National Accelerator Lab., Batavia, Ill.

ANTIPROTON SOURCE BEAM POSITION SYSTEM

T. Bagwell, S. Holmes, J. McCarthy, and R. Webber May 1984 45 p Sponsored by DOE

(DE84-016716; PNAL-TM-1254) Avail: NTIS HC A02/MF A01

The TeV I Beam Position Monitor (BPM) system is designed to provide a useful diagnostic tool during both the commissioning and operational phases of the antiproton source. The design goal is to provide single turn beam position information for intensities of $> 1 \times 10$ to the 9th particles, and multi-turn (closed orbit) information for beam intensities of $> 1 \times 10$ to the 7th particles, both with submillimeter resolution. It is anticipated that the system will be used during commissioning for establishing the first turn through the debuncher and accumulator, for aligning injection orbits, for providing information necessary to correct closed orbits, and for measuring various machine parameters (tunes, dispersion, apertures, and chromaticity). During normal antiproton operation the system will be used to monitor the beam position throughout the accumulation process. Author

N85-18680# Oak Ridge National Lab., Tenn.

IONIC AND MOLECULAR TRANSPORT IN BETA- AND BETA"-ALUMINA

J. B. Bates Mar. 1984 19 p refs Presented at the INDO-US Workshop on Diffusion in Solids, Bombay, 9 Jan. 1984

(Contract DE-AC05-84OR-21400)

(DE85-000984; CONF-840145-4) Avail: NTIS HC A02/MF A01

Investigations of rapid transport of cations and water molecules in the (BETA)- and (BETA) double prime-alumina family of superionic conductors are reviewed. Particular topics that are discussed include the Haven ratio and mixed-ion effects in (BETA)-alumina, and the influence of superlattice ordering on ionic transport in (BETA) double prime-alumina. DOE

N85-18681# Oak Ridge National Lab., Tenn.

ORNL ECR MULTICHARGED ION SOURCE

F. W. Meyer 1984 20 p refs Presented at the Intern. Conf. on the Physics of Highly Ionized Atoms, Oxford (England), 2-5 Jul. 1984

(Contract DE-AC05-84OR-21400)

(DE85-001283; CONF-840788-2) Avail: NTIS HC A02/MF A01

A multicharged ion source based on Electron Cyclotron Resonance (ECR) heating was designed and built at ORNL. The ECR ion source, which is completely dedicated for atomic physics collision studies, produces higher charge states and higher beam intensities than the present ORNL PIG multicharged ion source, and will thus permit study of collision processes involving ions of

higher charge states in experiments requiring higher beam intensities than could be previously obtained in the laboratory. The source has already produced up to fully stripped C and O beams, as well as up to He-like Ar beams. Measurements of the energy spread of ions extracted from the ion source operating in both single-stage and two-stage mode are described. In addition, initial results of total cross section measurements for fully stripped light ions incident on atomic hydrogen in the energy range 0.2 to 10 keV are presented. B.G.

N85-18682# Oak Ridge National Lab., Tenn.
MULTIPHOTON IONIZATION OF CESIUM ATOMS ABOVE AND BELOW THE TWO-PHOTON IONIZATION THRESHOLD
A. Dodhy, J. A. D. Stockdale, and R. N. Compton 1984 8 p refs Presented at 2nd Topical Meeting on Laser Techniques in the Extreme Ultraviolet, Boulder, Colo., 5 Mar. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000976; CONF-840387-11) Avail: NTIS HC A02/MF A01

Two and three photon ionization processes in cesium atoms using a single pulsed dye laser and a cesium atomic beam were investigated. Photoelectron angular distributions were measured for two photon resonant, three photon ionization via the nd states (n = 12, 15, and 21), for two photon nonresonant transitions over the photoelectron energy range from aporox. 26 to 100 MeV, and for quasi-free-free transitions. DOE

N85-18683# Tennessee Univ., Knoxville.
FORWARD ELECTRON PRODUCTION IN HEAVY ION-ATOM AND ION-SOLID COLLISIONS
I. A. Sellin 1984 14 p refs Presented at Intern. Conf. on X-ray and Inner-shell processes in Atoms, Molecules and Solids, Leipzig, D.R. Germany, 20 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001256; CONF-840829-3) Avail: NTIS HC A02/MF A01

A sharp cusp in the velocity spectrum of electrons, ejected in ion-atom and ion-solid collisions, is observed when the ejected electron velocity vector matches that of the emergent ion vector in both speed and direction. Close examination of recent data shows that low lying continuum states (ELC) cusps are nearly symmetric, with widths nearly independent on emergent ion vector in the velocity range 6 to 18 a.u. Convoy electron cusps produced in heavy ion-solid collisions at MeV/u energies exhibit approximately velocity-independent widths very similar to ELC cusp widths. While the shape of the convoy peaks is approximately independent of projectile, velocity, and of target material, that the yields in polycrystalline targets exhibit a strong dependence on projectile and velocity. While attempts have been made to link convoy electron production to binary ECC or ELC processes, sometimes at the last layer, or alternatively to a solid-state wake-riding model, measured dependences of cusp shape and yield on projectile charge state and energy are inconsistent with the predictions of available theories. DOE

N85-18684# Oak Ridge National Lab., Tenn.
EFFECTS OF DC ELECTRIC FIELDS ON MULTIPHOTON IONIZATION SPECTRA IN CESIUM
C. E. Klots and R. N. Compton 1984 9 p refs Presented at 3rd Intern. Conf. on Multiphoton Processes, Iraklion, Greece, 4 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001542; CONF-8409129-2) Avail: NTIS HC A02/MF A01

The three-photon (one frequency) ionization of cesium atoms is greatly enhanced when the second photon is resonant with a Rydberg nd level. Enhancement by the ns levels is comparatively small. Three-photon ionization is also observed when the first photon excites a quadrupole transition to 5d spin-orbit states, or when the second photon is resonant with the 7f state. A dc electric field introduces a number of new features: (1) high Rydberg states can be field-ionized; (2) the photoionization cross sections of the ns levels are greatly enhanced; (3) two-photon access to the np and nf series is induced; and (4) two-photon access to 7g (via a virtual quadrupole transition to 5d) is observed. These effects were quantified, the role of laser polarization documented, and a useful scaling law (as a function of the effective principle quantum number) was demonstrated. DOE

N85-18685# Los Alamos Scientific Lab., N. Mex.
FORCE BALANCE LIMITING CURRENT FOR CHARGED PARTICLE BEAMS
Abraham Kadish Jul. 1984 7 p refs
(Contract W-7405-ENG-36)
(DE84-016976; LA-10150) Avail: NTIS HC A02/MF A01

A limiting current for cold, relativistic, charged particle beams is derived. Arbitrary rotation and axial flow profiles are allowed. Only force balance is required. A comparison with the usual Brillouin condition reveals a significantly more restrictive scaling for ambitious beam parameters. DOE

N85-18686# Massachusetts Univ., Amherst. Dept. of Physics and Astronomy.
STUDIES OF P-SHELL NUCLEI BY LARGE MOMENTUM TRANSFER ELECTRON SCATTERING
Ross S. Hicks 1984 13 p refs Presented at the Intern. Conf. on Particles and Nuclei, Heidelberg (West Germany), 30 Jul. 1984
(Contract DE-AC02-76ER-02853)
(DE84-016803; DOE/ER-02853/23; CONF-840789-1) Avail: NTIS HC A02/MF A01

The use of transverse electron scattering as a technique for studying the structure of 1p-shell nuclei is briefly reviewed. At the present time there exist unresolved problems such as missing strength in comparison with shell model calculations. At the same time, the observed cross sections fall off more slowly than expected at high momentum transfers. The derivation of phenomenological wave functions for the ground and 2.313 MeV states in N-14 is described. DOE

N85-18687# Vanderbilt Univ., Nashville, Tenn.
THEORETICAL STUDIES OF ATOMIC TRANSITION Progress Report, 15 Mar. 1982 - 14 Mar. 1985
C. F. Fischer Sep. 1984 21 p refs
(Contract DE-AS05-80ER-10618)
(DE85-001325; DOE/ER-10618/13) Avail: NTIS HC A02/MF A01

Allowed and forbidden transitions were studied for a number of atomic systems, of interest in fusion research, using the multiconfiguration Hartree-Fock method with relativistic corrections in the Breit-Pauli approximation. To perform these studies, an atomic structure software package was designed with computers such as the VAX 11/780 in mind. Numerical procedures are being developed which will extend the program capability to continuum functions which arise in photoionization calculations. Extensive studies were performed of fine structure splittings and transition rates (E2 and M1) for the ground configurations of the Boron, Nitrogen and Oxygen sequences within the MCHF + BP approximation. Allowed 2s (YIELDS) 2p transitions for the latter were also considered. Calculations for the Carbon sequence are in progress. In an attempt to improve the level of accuracy for few electron systems, programs were developed which would include the mass polarization correction, arising from the finite mass of the nucleus. DOE

N85-18688# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
CONFINEMENT OF LOW-ENERGY ELECTRONS NEAR METALLIC SURFACES FOR PLASMON GENERATION
R. J. Warmack, T. L. Ferrell, R. H. Ritchie, R. S. Becker, K. C. Mamola, M. C. Buncick, H. H. Hubbell, and R. D. Birkhoff 1984 15 p refs Presented at Warner-Brandt Workshop on Penetration Phenomena: In Elastic Near-Surface Interaction, Oak Ridge, Tenn.
(Contract DE-AC05-84OR-21400)
(DE85-001119; CONF-8404190-2) Avail: NTIS HC A02/MF A01

A method is described for studying the energy loss spectrum of aloof (nontouching) electrons with surfaces. Metallic foils perforated by microchannels restrict the maximum impact parameter to the channel radius (20 to 200 nm). The passage of electrons

(20 eV to 2000 eV) near the cylinder walls results in prominent energy-loss structure. In silver, a resonance loss peak at 3.5 to 3.6 eV is attributed to the formation of surface plasmons on the silver channels. The problem is modeled by a classical calculation of a charge moving parallel to a plane surface whose response is given by tabulated optical properties. The differential probability is calculated assuming the lower limit to the impact parameter is determined by surface roughness. The calculations are compared with the experimental data. DOE

N85-18689# Oak Ridge National Lab., Tenn.
LARGE ELECTROSTATIC ACCELERATORS
C. M. Jones 1984 9 p refs Presented at the 10th Intern. Conf. on Cyclotrons and Their Applications, East Lansing, Mich., 30 Apr. - 3 May 1984
(Contract DE-AC05-84OR-21400)
(DE85-001120; CONF-8404143-23) Avail: NTIS HC A02/MF A01

The status of large electrostatic accelerators designed to operate at terminal potentials of 20 MV or above is discussed as well as several technological advances which may be expected to further improve their performance. The motivation for the construction of large electrostatic accelerators, several large electrostatic accelerators, recently completed or under construction, innovations which may be expected to improve the performance of large electrostatic accelerators, and an innovative large electrostatic accelerator whose construction is scheduled to begin next year are considered with focus on tandem accelerators. DOE

N85-18690# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
ATOMIC AND MOLECULAR COLLISION PROCESSES Progress Report
David W. Norcross and Gordon H. Dunn (National Bureau of Standards, Boulder) 30 Jul. 1984 8 p
(Contract DE-AI01-76PR-06010)
(DE85-001604; DOE/PR-06010/T34) Avail: NTIS HC A02/MF A01

Recent progress and planned work in a long-term program of code development and high precision calculations for electron collisions with atoms, atomic ions, and molecules is summarized. In electron-ion collisions, the primary concern is the fundamental physics of the process that controls excitation in high temperature plasmas. In the molecular work, one interim goal is a capability for accurate calculations of ro-vibrational excitation of polyatomic molecules by electrons; the ultimate objective is a capability for specification of continuum states of electron-molecule systems for use in calculations of dynamical processes, e.g., associative-detachment and dissociative-attachment. DOE

N85-18691# Fermi National Accelerator Lab., Batavia, Ill.
NEUTRAL-CURRENT X-DISTRIBUTIONS
D. Bogert, R. Burnstein, R. Fisk, J. Bofill, W. Busza, T. Eldridge, J. I. Friedman, M. Abolins, R. Brock et al Jun. 1984 19 p refs Presented at the 11th Intern. Conf. on Neutrino Phys. and Astrophys., Nordkirchen bei Dortmund (West Germany), 11 Jun. 1984 Prepared in cooperation with MIT, Cambridge and Michigan State Univ., East Lansing
(Contract DE-AC02-78ER-05023)
(DE84-016522; DOE/ER-05023/3; CONF-8406128-2) Avail: NTIS HC A02/MF A01

The role of the semi-leptonic neutral current interaction as a probe of nucleon structure is examined. Previous measurements of neutral current x-distributions are reviewed, and new results from the Fermilab - MIT - MSU collaboration are presented. DOE

N85-18692# Fermi National Accelerator Lab., Batavia, Ill.
BUNCH COALESCING IN THE MAIN RING TO FORM INTENSE PROTON AND ANTIPROTON BUNCHES WITHOUT RF COUNTERPHASING
J. E. Griffin, J. A. MacLachlan, G. N. Nicholls, and Z. B. Qian 9 Aug. 1984 19 p refs
(Contract DE-AC02-76CH-03000)
(DE85-001364; FNAL-TM-1280) Avail: NTIS HC A02/MF A01

Both the protoin and antiproton bunches which will collide in the Tevatron have longitudinal emittance greater than can be accelerated by the main ring from 8 GeV without large loss and emittance growth. Adiabatic debunching of several adjacent 53 MHz bunches by smooth reduction of the RF voltage from approx. 1 MV to approx. 100 V is required. The very low voltage is extremely difficult to attain with a high-Q system designed for megavolt accelerating potential. The counterphasing technique of voltage reduction which was used in main ring experiments and proposed for the TeV I project is to divide the accelerating cavities into two closely matched groups and to smoothly shift the relative phase of the drive to the two groups by 180 degrees. When the net voltage was reduced by this means to the lowest practical level, about 10 kV, the final voltage reduction may be performed by turning off the high-Q system and using a low-Q cavity. The voltage induced on the undriven gaps of the high-Q system is low enough not to be a major problem because the total intensity is low. However, the effects are not negligible, and dynamic beam loading compensation is required. DOE

N85-18693# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
STOPPING POWERS OF SOLIDS FOR LOW-ENERGY PROTONS
J. C. Ashley and R. H. Ritchie 1984 5 p refs Presented at the Warner-Brandt Workshop on Penetration Phenomena: In Elastic Near-Surface Interaction, Oak Ridge, Tenn., 12 Apr. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001123; CONF-8404190-1) Avail: NTIS HC A02/MF A01

Electron gas models are useful approximations for describing the valence electron response of a solid to the passage of a charged particle. A simple free-electron gas model was used by Fermi and Teller to estimate the time required for a mesotron to be stopped in various solids. More recent work has employed the Lindhard dielectric response function, or approximations thereto, for calculations of the valence electron contributions to energy loss per unit pathlength for protons. Such calculations have generally shown rather poor agreement with experimental data for low-energy protons (velocity small compared to the Fermi velocity, V< < V (sub F). The purpose is to draw attention to a recent calculation of the stopping power for slow protons using a density-functional formalism. These new results were shown to give good agreement with experimental data and thus should provide valuable theoretical guidance in estimating stopping powers of solids for which no experimental data are available. DOE

N85-18189# Yamaguchi Univ. (Japan). Dept. of Electrical Engineering.
THE ROLE OF FAST ELECTRONS FOR THE PERFORMANCE CHARACTERISTICS OF HYDROGEN ION SOURCES
Osamu Fukumasa and Setsuo Saeki *In its* Technol. Repts. of the Yamaguchi Univ., Vol. 3, No. 3 Dec. 1984 p 257-268 refs (For primary document see N85-18182 09-31)
Avail: NTIS HC A04/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-18694# Rockwell International Corp., Richland, Wash.
ROCKWELL HANFORD OPERATIONS DEFENSE WASTE AND BYPRODUCTS MANAGEMENT Monthly Report, Jun. 1984
Jun. 1984 109 p
(Contract DE-AC06-77RL-01030)
(DE85-000553; RHO-PB-SR-10-B-WM) Avail: NTIS HC A06/MF A01

Activities, problem areas, and financial status of the defense waste and byproducts management program are reported. Progress

in specific program tasks including maintenance and surveillance, waste concentration and solidification, encapsulation, facilities decontamination, and waste storage is outlined. M.G.

N85-18695# Oak Ridge National Lab., Tenn.
INSTRUMENTATION AND CONTROLS EVALUATION FOR SPACE NUCLEAR POWER SYSTEMS
J. L. Anderson and L. C. Oakes 1984 23 p refs Presented at the Symp. on Space Nucl. Power Systems, Albuquerque, N. Mex., 10 Jan. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000983; CONF-840113-9) Avail: NTIS HC A02/MF A01

Design of control and protection systems should be coordinated with the design of the neutronic, thermal-hydraulic, and mechanical aspects of the core and plant at the earliest possible stage of concept development. An integrated systematic design approach is necessary to prevent uncoordinated choices in one technology area from imposing impractical or impossible requirements in another. Significant development and qualification will be required for virtually every aspect of reactor control and instrumentation. In-core instrumentation widely used in commercial light water reactors will not likely be usable in the higher temperatures of a space power plant. Thermocouples for temperature measurement and gamma thermometers for flux measurement appear to be the only viable candidates. Recent developments in ex-core neutron detectors may provide achievable alternatives to in-core measurements. Reliable electronic equipment and high-temperature actuators will require major development efforts. DOE

N85-18696# Sandia Labs., Albuquerque, N. Mex.
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PRELIMINARY REPOSITORY CONCEPTS REPORT
J. L. Jackson, comp. Sep. 1984 215 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002132; SAND-83-1877) Avail: NTIS HC A10/MF A01

The preliminary repository concepts developed for the Nevada Nuclear Waste Storage Investigations Project are given. The concepts are for a high-level radioactive waste repository with a capacity of up to 70,000 metric tons (77,175 tons) of heavy metal initially loaded in commercial power reactors. The repository site being investigated is on and adjacent to the Nevada Test Site. The 8,094,000-m(2) (2000-acre) underground portion of the repository to be used for waste emplacement is above the water table and beneath Yucca Mountain within a welded tuff formation. The surface facilities of the repository will be located to the east of Yucca Mountain on a 304,000-m(2) (75-acre) site and include the waste-handling and surface support structures. Concepts for final closure of the underground portion of the repository and for decomissioning the surface facilities are also discussed. The engineering studies being performed in support of the design bases and design criteria are summarized. The preliminary concepts presented here will be used as a basis for the conceptual design of the repository. DOE

N85-18697# Argonne National Lab., Ill. Environmental Research Div.
PLANNING FOR GREATER-CONFINEMENT DISPOSAL
T. L. Gilbert, C. Luner, N. K. Meshkov, L. E. Trevorrow, and C. Yu 1984 16 p refs Presented at the 6th Ann. Low-Level Waste Management Program Participants' Information Meeting, Denver, 11 Sep. 1984
(Contract W-31-109-ENG-38)
(DE85-002143; CONF-8409115-3) Avail: NTIS HC A02/MF A01

The preparation of a document that will summarize procedures and technical information needed to plan for and implement greater-confinement disposal (CGD) of low-level radioactive waste is presented. Selection of a site and a facility design (Phase I), and construction, operation, and extended care (Phase II) will be covered in the document. Phase I includes determination of the need for GCD, design alternatives, and selection of a site and facility design. Alternative designs considered are augered shafts, deep trenches, engineered structures, high-integrity containers, hydrofracture, and improved waste form. Design considerations and specifications, performance elements, cost elements, and comparative advantages and disadvantages of the different designs are covered. Procedures are discussed for establishing overall performance objectives and waste-acceptance criteria, and for comparative assessment of the performance and cost of the different alternatives. DOE

N85-18698# Oak Ridge National Lab., Tenn.
PERSPECTIVE ON DEMONSTRATIONS OF COMPLIANCE FOR HIGH-LEVEL WASTE DSIPOSAL
D. C. Kocher, E. D. Smith, G. D. OKelly, and A. L. Sjoreen 15 Mar. 1984 19 p refs Presented at Waste Management '84, Tucson, Ariz., 11 Mar. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000989; CONF-840307-48) Avail: NTIS HC A02/MF A01

The problem of demonstrating compliance of high-level waste repositories system performance standards is addressed because of concern that the US Environment Protection Agency's proposed environmental standard for high-level waste disposal appears to require demonstrations of compliance which are incompatible with scientific knowledge, and that the federal agencies involved in the licensing process may not appreciate fully the extent of unquantifiable and uresolvable uncertainty in repository performance-assessment models. A general approach to demonstrations of compliance is proposed which is considered to be compatible to be compatible with the kinds of technical information that should be available for judging repository performance. The importance of investigating alternative conceptual models and lines of reasoning in evaluating repository performance and the importance of subjective scientific judgment in the decision-making process are emphasized. DOE

N85-18699# Southern States Energy Board, Atlanta, Ga.
COMMISSION OPERATION. NATIONAL LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PROGRAM
Sep. 1984 27 p Prepared in cooperation with Edgerton, Germeshausen and Grier, Idaho Falls, Idaho
(Contracts DE-FG07-83ID-12434; DE-AC07-76ID-01570)
(DOE/LLW-33T) Avail: NTIS HC A03/MF A01

Since Congress enacted the Low-Level Radioactive Waste Policy Act, the states have prepared to meet their responsibilities for management of low-level radioactive waste by entering into regional compacts. This option document is intended to provide a framework for the operation of a compact commission formed as the governing body of a low-level radioactive waste compact. The document is designed to be easily modified to meet the needs of various regional compacts. The ideas and format presented were taken in general from the Federal Administrative procedures Act, various state administrative procedures, and the state regulatory agencies' rules of procedure. Requirements of filing, time frames, and standard language are written from a legal perspective. DOE

N85-18700# California Univ., Irvine. Dept. of Physics.
HIGH ENERGY PHYSICS STUDY Final Report
J. Schultz and M. A. Mandelkern 1984 22 p refs
(Contracts DE-AT03-76ER-70149; DE-AS03-76SF-00034)
(DE84-015803; DOE/ER-70149/T3) Avail: NTIS HC A02/MF A01

Activities of the Experimental High Energy Physics Group at the University of California, Irvine, prior to its merger (as Task B) with the UCI Neutrino Group under a single contract are reported. The earlier antiproton bubble chamber experiments performed by the group are presented and also the more recent counter experiments performed at Brookhaven National Laboratory and CERN to search for bound and resonant states in the nucleon-antinucleon system. DOE

74 OPTICS

Includes light phenomena.

N85-18701 Virginia Univ., Charlottesville.
THEORY OF RESONANT LIGHT SCATTERING FROM A ROUGH

SURFACE Ph.D. Thesis
Gregory Clifford Brown 1984 106 p
Avail: Univ. Microfilms Order No. DA8424886

The Rayleigh method of wave scattering from rough surfaces is briefly reviewed and applied to the problem of light scattering from a rough surface described by a two-dimensional shape function D(vector R). The resulting equation is recast as a two-dimensional Lippman-Schwinger equation with an effective potential that is shown to be a reciprocal and hermitian matrix, in the absence of internal damping; this in turn leads to a reciprocal and unitary S-matrix. By using similar techniques, explicit equations are derived for the scattering of light from a statistically rough surface, along with the appropriate Ward identifies. This formalism enables one to include the multiple scattering of light through intermediate surface polaritons in a manner that guarantees reciprocity and unitarity of the S-matrix. A simple closed form solution to these equations in the lowest flux-conserving approximation is presented, along with calculations of the scattering and absorption of light from a rough silver surface, thereby clarifying the role that surface polaritons play in these processes.
Dissert. Abstr.

N85-18702# Mississippi Univ., University. Dept. of Electrical Engineering.
AN OPTICALLY COUPLED SAMPLING SYSTEM WITH 4 GHz BANDWITH Report, 1 Jan. 1981 - 30 Sep. 1984
S. B. Samaan, L. Wilson Pearson, and Charles E. Smith 30 Oct. 1984 172 p
(Contract N00014-81-K-0256)
(AD-A148057) Avail: NTIS HC A08/MF A01 CSCL 20/6

A new approach to the design of an optically coupled multi-gigahertz sampling system with improved bandwidth is reported. The system utilizes the Tektronix S-6 sampling head, the Tektronix 7S122 TDR/Sampler plug-in unit, and a Tektronix 7000 series oscilloscope mainframe. Three fiber optic links replace existing hardwired conductors which convey the vertical error and feedback signals and the horizontal sampling command signal between the sampling head and the oscilloscope sampling plug-in. GRA

N85-18703# Ohio State Univ., Columbus.
OPTICAL FLOW AND TEXTURE VARIABLES USEFUL IN DETECTING DECELERATING AND ACCELERATING SELF-MOTION Interim Paper, Apr. - Dec. 1983
Dean H. Owen Nov. 1984 150 p
(Contract F33615-83-K-0038; AF Proj. 2313)
(AD-A148718; AFHRL-TP-84-4) Avail: NTIS HC A07/MF A01 CSCL 20/6

The two experiments presented in this report are part of a program that has the goals of mathematically isolating global optical candidates for self-motion information and of empirically assessing their usefulness. The first experiment tested sensitivity to loss in speed and demonstrated that: (1) increasing fractional loss was easier to detect than invariant fractional loss, (2) the optimal optical texture density was one ground unit per eyeheight (altitude unit), (3) optimal combinations of flow deceleration and flow rate were found, but differ slightly with level of fractional loss in flow rate, and (4) males were more accurate than females. The second experiment separated flow-rate and edge-rate variables and tested for sensitivity to gain in speed with the following results: (1) sensitivity to flow-rate gain was independent of sensitivity to edge-rate gain, (2) the influences of initial flow rate and initial edge rate were independent, (3) sensitivity to edge-rate gain increased with event duration, (4) illusory edge-rate information was more salient than veridical flow-rate information, and (5) some individuals were more flow-rate dependent, some more edge-rate dependent, but no sex difference was observed. Theoretical implications for the ecological approach to the study of perception and for the study of information specifying mechanisms are discussed. GRA

N85-18704# Stanford Univ., Calif. Lab. of Physics.
ACOUSTIC MICROSCOPY AT CRYOGENIC TEMPERATURES Final Report, 1 Jul. 1977 - 30 Jun. 1984
C. F. Quate, Daniel Rugar, and John Foster Nov. 1984 103 p
(Contract N00014-77-C-0412; NR Proj. 384-924)
(AD-A148755; GL-3795) Avail: NTIS HC A06/MF A01 CSCL 20/6

The resolution of the acoustic microscope is greatly enhanced by using cryogenic liquids for the coupling medium. Liquid Argon, Nitrogen, and Superfluid Helium have all been used for acoustic microscopy during this program. Superfluid helium at temperatures less than 0.2 K emerges as the ultimate fluid for high resolution acoustic microscopy. Using coherent 300 A sound waves in helium, images with a resolution of 200A have been produced. Author (GRA)

N85-18705# California Univ., Berkeley. Lawrence Berkeley Lab.
CALCULATION AND COMPUTER SIMULATION OF THE PARABOLOIDAL MIRROR ANALYZER (PMA)
B. Liu, J. J. Barton, C. C. Bahr, and D. A. Shirley Aug. 1984 57 p refs
(Contract DE-AC03-76SF-00098)
(DE85-001417; LBL-18216) Avail: NTIS HC A04/MF A01

A semianalytical method is proposed to calculate the electric field and electron motion inside the paraboloidal electron mirror. The error of field calculation is not more than 0.01% and that of electron motion calculation is not more than 0.1%. Calculation and computer simulation show that such an electron mirror can give very good angle resolution even for electrons having a wide energy spectrum. DOE

N85-18706# California Univ., Berkeley. Lawrence Berkeley Lab.
LIGHTING CONTROLS: THE ROLE OF ADVANCED TECHNOLOGY; PAST, PRESENT AND FUTURE
R. R. Verderber and F. M. Rubinstein May 1984 17 p refs Presented at Natl. Res. Council of Canada's Lighting Control Symp., Ottawa, 28 Jun. 1984
(Contract DE-AC03-76SF-00098)
(DE84-015977; LBL-17967; CONF-8406200-1) Avail: NTIS HC A02/MF A01

The role of technology in the development of lighting control systems is examined. Prior to 1973, control systems were primarily functional. They were used to switch lamps on and off, or to create a mood. Nearly all dimming was done with incandescent lamps. Since 1973, the rising cost of electrical energy has made the operational cost of systems a design factor. Lighting controls are used to decrease power, reduce the time of use, and lower peak power demands. New lighting control equipment is based on existing technologies that were modified to meet the needs of lighting systems. The technologies came primarily from the field of electronics. DOE

N85-18707# Los Alamos Scientific Lab., N. Mex.
CURRENT MEASUREMENTS BY FARADAY ROTATION IN SINGLE MODE OPTICAL FIBERS
G. I. Chandler and F. C. Jahoda 1984 14 p refs Presented at the 5th APS Topical Conf. on High Temp. Plasma Diagnostics, Tahoe City, Calif., 16 Sep. 1984
(Contract W-7405-eng-36)
(DE85-002025; LA-UR-84-2905; CONF-840922-8) Avail: NTIS HC A02/MF A01

Techniques for measuring magnetic fields and currents by Faraday rotation in single-mode optical fibers are described. The results of attempts to measure the toroidal plasma current in the ZT-40 Reversed-Field-Pinch using multi-turn fiber coils are discussed. The fiber response is reproducible and in accord with theory, but the amount and distribution of the stress-induced birefringence in this case are such that prediction of the sensor response at low currents is difficult if not impossible. The low-current difficulty can be overcome by twisting the fiber to induce a circular birefringence bias. The results of auxiliary experiments with a fiber that has been twisted with 15 turns per meter and then re-coated to lock the twist in place are reported. DOE

N85-18708# Army Research and Development Command, Dover, N.J.

SURVEY OF THE FINISH CHARACTERISTICS OF MACHINED OPTICAL SURFACES

E. I. Church and P. Z. Takacs (BNL) Aug. 1984 103 p Presented at the SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984

(Contract DE-AC02-76CH-00016)

(DE85-001343; BNL-35171; CONF-840872-28) Avail: NTIS HC A06/MF A01

The findings of a survey of the finished characteristics of machined optical surfaces are reported. The names, addresses, points of contact and telephone numbers of each of the nine participating suppliers are listed alphabetically. The machining parameters provided by and/or derived from information supplied by the manufacturer are summarized. These parameters include: surface material; machine feeds and speeds; tool-mark spacing (d); tool tip radius (R) and ideal RMS surface roughness computed using the expression (comments section which includes general remarks about the sample or its measurement for example: discoloration, scratches, graininess, excrescences, homogeneity). Several measurements were made on each sample at different positions. For surfaces turned off-center, this position is generally at the center of the sample. For surfaces turned on-center, this position is somewhere near the edge. Data are presented in the form of two pages for each measurement, consisting of two graphs of the surface profile on one page and two graphs of the periodogram on the second page. DOE

N85-18709# Los Alamos Scientific Lab., N. Mex.

SIMULATION OF BENT CRYSTAL SPECTROMETERS

G. A. Kyrala 1984 12 p Presented at the 5th Topical Conf. on High Temp. Plasma Diagnostics, Lake Tahoe, Nev., 16 Sep. 1984

(Contract W-7405-eng-36)

(DE85-002042; LA-UR-84-3015; CONF-8409157-1) Avail: NTIS HC A02/MF A01

In crystal spectrometers one traditionally labels each position in the dispersion/recording plane by a single wavelength value. A simple examination of the crystal spectrometers shows that different areas of the crystal contribute different wavelengths at the same position in the recording plane. Using collimators and apertures one may reduce these effects, as well as reduce the collected signal. Convolving the system response, in that case, may not allow simple analytic estimates of the sensitivity/responsivity of the system. A Monte-Carlo ray-trace program was written in order to study and simulate the real geometry including finite source size effects. The results of using the code will be presented, demonstrating the contributions to the resolution and absolute responsivity, for a particular parabolically bent crystal spectrometer. DOE

N85-18710# Idaho National Engineering Lab., Idaho Falls. Diagnostics Measurements Branch.

RADIATION RESPONSE OF OPTICAL FIBERS IN A NUCLEAR REACTOR

Judy K. Partin 1984 8 p refs Presented at the SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984

(Contract DE-AC07-76ID-01570)

(DE84-017221; EGG-M-05984; CONF-840872-27) Avail: NTIS HC A02/MF A01

The development and application of fiberoptic-based instrumentation for use in nuclear reactor research was studied. To aid in this development effort, a testing program was undertaken to quantify optical losses in promising waveguide materials during radiation exposure at elevated temperatures characteristic of reactor environments. Results of testing conducted during the fuel-conditioning phase of the Severe Fuel Damage Test 1-1A were reported. Two identical sets of samples were placed in a specially designed test fixture and positioned approximately 60 centimeters above the reactor core: one at 200 C, while the second remained at 20 C. The radiation-induced optical attenuation was monitored in several spectral bands. The in situ measurements were recorded over a 125 hour period during which the reactor power varied between 0.1 to 22 MW thermal. The samples were exposed to average fluxes of 2.8 x 10 to the ninth power n/cm(2)/sec thermal neutrons, 4.4 x 10 to the eighth power n/cm(2)/sec fast (> 1 MeV) neutrons, and dose rates of approximately 10 to the sixth power rad/hr gamma radiation. The growth and recovery of radiation-induced losses as a function of wavelength, temperature, and reactor power level are presented. DOE

N85-18711# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

EFFECTIVE ANTIREFLECTION COATINGS OF TRANSPARENT POLYMERIC MATERIALS BY GAS-PHASE SURFACE FLUORINATION

Gary Jorgensen and Paul Schissel Jul. 1984 9 p refs Presented at the SPIE Ann. Tech. Symp., San Diego, Calif., 19-24 Aug. 1984

(Contract DE-AC02-83CH-10093)

(DE84-013027; SERI/TP-255-2387; CONF-840872-24) Avail: NTIS HC A02/MF A01

There is a dramatic need in solar energy collection systems for lightweight, inexpensive polymeric materials that exhibit improved performance and durability. One approach to altering the properties of polymeric materials, surface fluorination, is appealing because of its potential for low cost. The literature indicates that such properties as permeability, wettability, bondability, thermal stability, weatherability, and optical transmittance can be improved by treating the surface with gaseous fluorine. A gas phase fluorination reactor system (GPFRS) was designed, built, and used. The initial emphasis was on improving optical transmittance by having an effective antireflection coating form on the surface of a wide variety of commercially available transparent polymeric films. These included such materials as polypropylene, acrylic, polyacrylonitrile, highly cross-linked polyethylene, polyester, polycarbonate and polymethylpentene. Two techniques were used to quantify the effect of exposing the surface of the polymers to gaseous fluorine. Transparent films were characterized before and after fluorine exposure by specular transmittance measurements. DOE

N85-18712# European Space Agency, Paris (France).

INVESTIGATIONS RELATING TO THE SIMULTANEOUS USE OF COMBINED OPTICAL ADAPTIVE TECHNIQUES (COAT) AND ANGLE-TRACKING

Friedrich Malota Jul. 1984 47 p refs Transl. into ENGISH of "Untersuch. zur gleichzeitigen Anwendung von COAT u. Winkeltracking" Rept. DFVLR-FB-83-17 DFVLR, Oberfaffenhofen, West Germany, May 1983 Original language document announced as N84-20347

(ESA-TT-844; DFVLR-FB-83-17) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 17,50

Combined application of coherent optical adaptive techniques (COAT) and angle tracking was investigated. The control signals for the adaptive optics were deduced by calculating the diffraction figures with two dephased waves. The calculations were carried out for a two-segment mirror while qualitative data were worked out for a four-segment mirror. Experiments were made with a five-segment mirror which in fact is a four-segment COAT mirror because of the securing of the center segment. It is shown that theoretical considerations and experimental results coincide for mirror positions. Author (ESA)

N85-18713# Fondazione Ugo Bordoni, Rome (Italy).

SELF-INDUCED NONLINEAR EFFECTS IN OPTICAL FIBERS: A UNIFIED APPROACH

Bruno Crosignani and Paolo DiPorto (Aquila Univ., Italy) Jul. 1982 22 p refs Sponsored by Ist. Superiore P.T.

(FUB-67-1982) Avail: NTIS HC A02/MF A01

A unified formalism by which self-phase modulation, envelope soliton propagation, longitudinal self-confinement, degenerate four-wave mixing, and nonlinear modal noise in optical fibers are analytically described is presented. Terms of a single system of nonlinear coupled differential equations can be specialized, case

by case, to represent particular propagation problems. Features associated with the fiber modal and chromatic dispersion and with its propagation-mode characteristics can be introduced directly, making the formalism suitable for studying nonlinear propagation in single mode and multimode optical fibers. Author (ESA)

N85-18714# European Space Agency, Paris (France).
REFLECTIVITY MEASUREMENTS OF LASER GYRO MIRRORS
Ruediger Rodloff and Werner Jungbluth Jul. 1984 50 p refs Transl. into ENGLISH of "Reflexionsmessung u. Laserkreiselspiegeln" Rept. DFVLR-FB-83-35 DFVLR, Brunswick, Jul. 1983 Original language document announced as N84-22434
(ESA-TT-851; DFVLR-FB-83-35) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 16

Reflectivity measurement of laser gyro mirrors using an active optical resonator is described. The measuring method was analyzed and compared to conventional laser mirror measuring results. It is concluded that the simple experimental equipment offers high resolution of 0.0006% and good long term repeatability of 0.013%. Author (ESA)

N85-17969# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
COLOR VISUAL SIMULATION APPLICATIONS AT THE DEFENSE MAPPING AGENCY
J. D. Simley *In* AF Human Resources Lab. The Image 3 Conf. Proc. Sep. 1984 p 95-107 (For primary document see N85-17962 09-01)
(AD-P004315) Avail: NTIS HC A22/MF A01 CSCL 08/2

N85-17977# Air Force Human Resources Lab., Williams AFB, Ariz.
CONSIDERATIONS IN AN OPTICAL VARIABLE ACUITY DISPLAY SYSTEM
R. B. Bunker and R. Fisher *In its* The IMAGE 3 Conf. Proc. Sep. 1984 p 239-251 (For primary document see N85-17962 09-01)
(AD-P004323) Avail: NTIS HC A22/MF A01 CSCL 01/2

N85-17987# Ohio State Univ., Columbus.
GLOBAL OPTICAL METRICS FOR SELF-MOTION PERCEPTION
D. H. Owen, L. Wolpert, L. J. Hettinger, and R. Warren *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 405-415 (For primary document see N85-17962 09-01)
(Contract F33615-83-K-0038)
(AD-P004333) Avail: NTIS HC A22/MF A01 CSCL 01/2

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-18715 California Univ., San Diego.
PHYSICS OF NONMAGNETIC RELATIVISTIC THERMAL PLASMAS Ph.D. Thesis
Charles Dennison Dermer 1984 162 p
Avail: Univ. Microfilms Order No. DA8423914

A detailed treatment of the kinematics of relativistic systems of particles and photons is presented. In the case of a relativistic Maxwell-Boltzmann distribution of particles, the reaction rate and luminosity are written as single integrals over the invariant cross section. The results are applied to the calculation of the annihilation spectrum of a thermal electron positron plasma. Relativistic thermal electron ion and electron electron bremsstrahlung are calculated exactly to lowest order, and relativistic thermal electron positron bremsstrahlung is calculated in an approximate way. Comptonization is developed. The question of thermalization of a relativistic plasma is considered. A formula for the energy loss or exchange rate from the interaction of two relativistic Maxwell-Boltzmann plasmas at different temperatures is derived. It is concluded that at temperatures greater than about 1 MeV, full thermalization of an electron proton plasma is not possible because of the dominance of bremsstrahlung losses. Application to a stable, uniform, nonmagnetic relativistic thermal plasma is made. Dissert. Abstr.

N85-18716# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DIFFUSION DRIVEN PLASMA CURRENT WITH TURBULENT DYNAMO
Kazunari Ikuta Oct. 1984 8 p refs
(IPPJ-700) Avail: NTIS HC A02/MF A01

The elimination of the seed current in diffusion-driven plasma currents is demonstrated by taking the pseudo-isotropic turbulence into account. Magnetohydrodynamic equations are considered. R.S.F.

N85-18717# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SLOW WAVE ANTENNA COUPLING TO ION BERNSTEIN WAVES FOR PLASMA HEATING IN ICRF
W. N-C. Sy (Australian National Univ., Canberra), T. Amano, R. Ando, A. Fukuyama (Okayama Univ.), and T. Watari Oct. 1984 34 p refs
(AD-B089084L; IPPJ-702) Avail: NTIS HC A03/MF A01

The coupling of ion cyclotron range of frequencies power from a slow wave antenna to a plasma with finite temperature is examined theoretically and compared to an independent computer calculation. It is shown that such antennas can be highly efficient in transferring most of the antenna power directly to ion Bernstein waves, with only a very small fraction going into fast waves. The potentiality of this coupling scheme for plasma heting in ICRF is briefly discussed. Author

N85-18718# Nagoya Univ. (Japan).
LAX-PAIR OPERATORS FOR SQUARED-SUM AND SQUARED-DIFFERENCE EIGENFUNCTIONS
Yoshi-Hiko Ichikawa and Kazu-Hiro Iino (Taiko Electronics Co. Ltd., Tokyo) Oct. 1984 12 p refs
(AD-B089083L; IPPJ-701) Avail: NTIS HC A02/MF A01

The inter-relationship between various representations of the inverse scattering transformation is established by examining eigenfunctions of Laxpair operators of the sine-Gordon equation and the modified Korteweg-de Vries equation. In particular, it is shown explicitly that there exists Lax-pair operators for the squared-sum and squared-difference eigenfunctions of the Ablowitz-Kaup-Newell-Segur inverse scattering transformation. M.G.

N85-18719# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROCEEDINGS ON US-JAPAN WORKSHOP ON TOKAMAK DIAGNOSTICS BY X-RAY, VUV AND OPTICAL RADIATIONS
J. Fujita, ed. Nov. 1984 145 p refs Proc. held at Nagoya Univ., 12-15 Nov. 1984
(IPPJ-703) Avail: NTIS HC A07/MF A01

Activities presented include: (1) recent experiments in large devices; (2) spectroscopy on large devices; (3) beam probe spectroscopy; (4) atomic processes in plasmas; (5) atomic data relevant to plasma diagnostics; and (6) instrumentations. For individual titles, see N85-18720 through N85-18747.

N85-18720# Princeton Univ., N. J.
X-RAYS SPECTROSCOPY ON THE PLT AND TFTR TOKAMAKS Abstract Only
M. Bitter *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1985 p 1 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

X-ray spectra of Ti XXI, Ti XXII and Fe XXV were observed from PLT and TFTR Tokamak discharges with curved crystal spectrometers of high spectral resolution (gamma/delta gamma = 15000 to 25000). The spectra have allowed performance of a detailed comparison with theoretical predictions, and were used for diagnosis of central ion and electron temperatures, measurements of the toroidal plasma rotation and investigations of the ionic charge state distribution and impurity transport. Recent results

from time resolved measurements of the Fe XXV dielectronic satellite spectrum during sawtooth oscillations in PLT discharges with intense RF (ion cyclotron) heating and the spectra of Ti XXI which were obtained from TFTR discharges during compression and first neutral beam heating experiments are presented. Also discussed is the design of a new TFTR crystal spectrometer which will allow simultaneous observation of spectra from high-Z impurities, e.g., Cr, Fe, Ni, along different radial chords. Author

N85-18721# Kyoto Univ. (Japan). Plasma Physics Lab.
PRESENT STATUS OF HELIOTRON E EXPERIMENT Abstract Only
A. Iiyoshi and F. Sano *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 2-3 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

Heliotron-E is the present largest helical system with R = 2.2m < r(subp) > = 20 cm, B = 2T. A (sub 9) = 2, m = 19 helical winding produces a large rotational transform angle and strong shear system. Plasma parameters, neutral beam injection heating, and thermal conductivity are discussed. B.G.

N85-18722# Kyoto Univ. (Japan). Plasma Physics Lab.
SPECTROSCOPIC MEASUREMENT ON HELIOTRON E
K. Kondo, H. Kaneko, H. Zushi, T. Mizuuchi, T. Mutch, S. Besshou, H. Okada, F. Sudo, M. Sato, O. Motojima et al *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 4-10 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

In the Heliotron E device one of the most important problems is to understand the behavior of the impurities. The impurity behavior was studied by observing impurity emissions with VUV spectrometers, a soft X-ray array and a bolometer array. Impurities were also injected in order to study their transport properties. In Heliotron E, two types of currentless plasma are made; those produced by ECRH alone, and those for which the ECRH plasmas is as a target for Neutral Beam Injection (NBI). The role of the impurities was discussed in each case, including the observed impurity transport, the absolute impurity densities, and the radiation losses. Author

N85-18723# Massachusetts Inst. of Tech., Cambridge.
RADIAL PROFILES OF HIGH RESOLUTION X-RAY SPECTRA FROM THE ALCATOR C TOKAMAK Abstract Only
Earl Marmar *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1985 p 11 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

A spatially scanning, high resolution X-ray spectrometer was used to obtain radial profiles of emission from hydrogen-, helium-, and lithium-like argon as well as helium-like sulphur and highly ionized molybdenum. Spectra were obtained under a wide range of operating conditions and scalings of various line ratios with plasma parameters and time during individual discharges will be presented. In the He-like spectra, the main emission features are from the resonance, intercombination and forbidden lines. Population of the upper levels for the central chord measurements is primarily due to electron impact excitation. In spectra obtained from the plasma edge, the forbidden line is the dominant transition. Measurements will also be presented of the absolute wavelengths of the Lyman alpha doublet in hydrogen-like argon (A(17+)). Wavelength calibration is achieved by utilizing the potassium k-lines from a KCl anode source. Overall experimental uncertainty is sigma gamma/gamma approximately equals .00001, leading to an estimate of the 1S Lamb shift accurate to about 0.05 eV. B.G.

N85-18724# Nagoya Univ. (Japan). Inst. of Plasma Physics.
RECENT ACTIVITIES ON JIPP T-IIU TOKAMAK Abstract Only
Junji Fujita *In its* Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 12-15 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The JIPP T-IIU, upgraded from JIPP T-II in FY 1982, is a medium size Tokamak with major radius 91 to 93 cm, plasma radius 23 to 25 cm of circular cross section, and the maximum toroidal magnetic field 3T. The device was mainly used for the studies of non-inductive current start-up by means of lower hybrid wave (LHW) and ion cyclotron range of frequency (ICRF) heating including ion Bernstain wave (IBW) heating. The influex of impurities and the growth of m = 2 mode are serious problems to be solved when high power ICRF heating is carried out on a Tokamak plasma. A strong gas-puffing and an additional rise of plasma current were applied during an ICRF heating (D2 + H2 minority) to overcome these difficulties. A significant reduction was observed in the influx of heavy impurities (Fe) as well as light impurities (C,o). The radial profiles of electron temperature and density and plasma current density are controlled favorably by this combination of the gas puffing and the current rise. B.G.

N85-18725# Nagoya Univ. (Japan). Inst. of Plasma Physics.
IMPURITY CONTROL BY ADDITIONAL CURRENT RISE AND GAS PUFFING DURING ICRF HEATING IN JIPP T-IIU TOKAMAK
K. Sato, K. Toi, T. Watari, and M. Otsuka *In its* Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 16-21 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

In general, radiation from impurity ions, (oxygen, carbon and metallic elements), increases substantially during the ICRF heating in comparison to the periods of the Tokamak discharges with ohmic heating only. This increase of impurity radiation is attributed to an enhanced impurity influx. The enhanced radiation loss and increased impurity density during heating affect the heating efficiency and plasma stability. Several attempts were tried against the above problem. A spectroscopic study of an impurity-suppressing effect in ICRF heating discharge assisted by additional current rise and strong gas puffing on the JIPP T-IIU Tokamak is presented. Possible mechanisms which are responsible for the impurity-suppressing are discussed. Author

N85-18726# Osaka Univ. (Japan). Inst. of Laser Engineering.
RECENT ICF RESEARCH BY GEKKO 12 GLASS LAYER AT ILE OSAKA
T. Yamanaka and C. Yamanaka *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 22-25 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

Inertial confinement fusion (ICF) using a glass laser, a Co2 laser and a particle beam is examined. In order to study the high density implosion physics; plasma Cannonball target, radiation Cannonball target, single shell targets with high and low aspect ratio, and cryogenic fuel targets were used. Implosion experiments of the Gekko XII are listed. The radiation properties of laser produced plasma and transport were also investigated. B.G.

N85-18727# Osaka Univ. (Japan). Inst. of Laser Engineering.
SOFT X-RAY SPECTROSCOPY OF LASER PRODUCED PLASMAS
T. Mochizuki, T. Yabe, and C. Yamanaka *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 26-29 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The diagnostic tools used for the measurement of soft X-ray emission from laser produced plasmas and present X-ray spectra obtained from plane targets in soft X-ray region, the conversion efficiency without assuming blackbody condition, their atomic number dependence, and the laser intensity dependence for gold targets are reviewed. Author

N85-18726# Nagoya Univ. (Japan). Inst. of Plasma Physics.
X-RAY SPECTROSCOPY OF HIGH-Z AND HIGH-DENSITY PLASMAS
S. Morita *In its* Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 30-38 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

X-ray spectra for several elements were observed from high-temperature plasmas produced in a vacuum spark using a curved crystal spectrometer. The wavelengths of the He-like resonance lines for Ti through Zn are determined. The Fe He-like resonance series lines up to 1s6p-1s(2) and the K beta spectra of partially M-shell-ionized ions are also observed. Analyses of these data and future plan on Tokamak X-ray spectroscopy are briefly discussed. Author

N85-18729# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EFFECT OF INNER SUBSHELL IONIZATION FOR EMISSION LINES OF OIV ION
Takako Kato, Kuniaki Masai, and Kuninori Sato *In its* Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 39-50 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

It is shown that the effects of the inner subshell ionization on the metastable states of O IV and O V ions are significant in ionizing plasmas. The intensities of line emissions of O IV and OV ions are measured in the JIPPT-IIU Tokamak plasma. From the analysis of the intensity ratios, the inner subshell ionizations 2s(2) 2p (2)p yields 2s2p (e)p + 3 and 2s(2) 2p(2) (3)p yields 2s2p(2) (4)p + e are found to be important especially for the O IV line. Author

N85-18730# Princeton Univ., N. J.
SPECTRA OF HIGHLY-IONIZED ATOMS FOR THE DIAGNOSTICS OF THE NEW GENERATION OF TOKAMAKS Abstract Only
Einar Hinnov *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 51 (For primary document see N85-18719 09-75)
(Contract DE-AC02-76-CH03073)
Avail: NTIS HC A07/MF A01

In the new large Tokamaks the central electron temperature is expected to reach 5 to 10 keV with densities in the neighborhood of 10 to the 14th power/cu cm. For appropriate diagnostics under such conditions the n=2 shells are considered from germanium to molybdenum, with particular emphasis on long-wavelength lines in the ground configurations of these atoms. These elements of course also emit light on the n=3 and n=4 configurations, which are to a large extent already known from past experiments, and will be useful for near peripheral diagnostics. In addition to the transitions within the ground configurations there are certain intercombination lines for some of the ionization states in the relatively uncrowded part of the spectra, as well as some lines of the neon-like configurations, that are of diagnostic interest. B.W.

N85-18731# Oak Ridge National Lab., Tenn. Fusion Energy Div.
SOURCES, DENSITIES, AND TRANSPORT OF IMPURITIES IN NEUTRAL-BEAM INJECTED TOKAMAKS Abstract Only
R. C. Isler *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 52-53 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The major areas of research on impurities in Tokamaks concern sources, production mechanisms, transport from the sources into the main body of a plasma, and confinement of entrained ions. The understanding of all these processes during neutral-beam injection in ISX-B has been expanded recently. This has come about by making broad use of charge-exchange excitation (CXE), by judiciously locating four calibrated spectrometers on the machine, and by installing pump limiters and solid beryllium limiters. Radiation in the VUV region is measured with both normal and grazing incidence instruments located so that their fields of view include neutral beams in order to detect CXE lines. These lines have been used to determine the interior concentrations of C, N, and O; to perform in situ relative calibrations of the grazing incidence instrument from 102 A to 1164 A; and to measure central plasma rotations. It has been possible to expand previous studies showing differences of impurity confinement with co- and counter injection to include fully ionized, low-Z elements. B.W.

N85-18732# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics and Astronomy.
SPECTROSCOPIC INSTRUMENTATION FOR TOKAMAK DIAGNOSTICS Abstract Only
Warren Moos *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 54 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

Extreme ultraviolet spectrograph detector systems which use a microchannel plate intensifier fiber-optically coupled to a linear silicon diode array will be described. Typically such systems have 1024 pixels and time resolutions approx > 1 ms. Results from recent diagnostic studies on large plasma devices with spectrographs and detectors of this type will be presented. A two dimensional detector system to provide approx simultaneous spectral and spatial coverage with a time resolution of approx 5 ms is under construction. The optical and detector design will be described as well as the expected performance. A photon counting image intensifier detector system has been constructed for ion-temperature/velocity-distribution measurements utilizing the doppler effect. Such a system requires very rapid readout electronics for the 128 pixel array, a high gain Z type microchannel plate to make thermal runaway a danger. The design considerations and expected performance of the system will be discussed.Author

N85-18733# Tohoku Univ., Sendai (Japan). Research Inst. for Scientific Measurements.
DESIGN OF VUV MONOCHROMATOR SYSTEMS
T. Namioka *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 55-60 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

When designing a grating instrument for use with a large light source, such as an electron storage ring, Tokamak, etc., various site-imposed constraints and requirements of paraticular experiments present complex design problems. A simple design method based on the first-order focal equations and magnifications of mirrors and gratings often ends up with an optical configuration whose performance is not as good as it is anticipated. Two possible ways to improve the situation are described: (1) development of an automatic total design method; and (2) utilization of new kinds of optical elements. An analytical expression of spot diagram is a powerful tool in the design of spectroscopic instruments, but it loses power when the number of optical elements increases. This difficulty can be overcome by tracing rays through the whole optical train and then by adjusting the design parameters so as to minimize the spread of spots. B.W.

N85-18734# GA Technologies, Inc., San Diego, Calif.
DETERMINATION OF ION TEMPERATURE AND ROTATION VELOCITY PROFILES BY VISIBLE, UV AND X-RAY SPECTROSCOPY ON DOUBLET 3 Abstract Only
K. H. Burrell, N. H. Brooks, R. J. Groebner, P. Lee, A. J. Lieber, C. L. Rottler, R. P. Seraydarian, and S. Wojtowicz *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 60 (For primary document see N85-18719 09-75)
(Contract DE-AT03-84ER-51044)
Avail: NTIS HC A07/MF A01

Spectroscopic diagnostics are utilized extensively on the Doublet 3 Tokamak to determine ion temperature and toroidal rotation speed by means of the Doppler broadening and Doppler shift of spectral lines radiated by various impurity ions. Ion temperatures up to 6 kev and rotation speeds up to 300 km/s

have been measured. Equipment employed in the four main systems ranges from visible spectrometers to a high resolution Bragg crystal X-ray spectrometer. Among the lines employed are visible and UV magnetic dipole lines of metallic impurities (e.g., Ti, Fe and Ni); visible and UV lines of He, C, and O excited by charge exchange recombination with neutrals from one of the hydrogen heating beams; and X-ray lines from He-like and Li-like Ti. The various systems give ion temperature profile information for discharges heated by Ohmic, neutral beam injection and electron cyclotron heating. Under neutral beam conditions, the systems based on charge exchange excitation produce seven point profiles every 20 ms for the duration of the heating pulse. The hardware utilized in each system, the theoretical basis for the data analysis and some of the difficulties encountered in extracting the desired information from complex spectra are discussed. B.W.

N85-18735# Kyushu Univ., Fukuoka (Japan).
DEVELOPMENTS AND APPLICATIONS OF LASER FLUORESCENCE SPECTROSCOPY FOR STUDIES OF PARTICLE BAHAVIOURS IN FUSION PLASMAS
K. Muraoka *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 61-67 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The understanding of temporal and spatial behavior of hydrogen (and its isotopes) and impurity atoms in fusion plasmas is expanded in this report. Efforts made in the development of laser fluorescence spectroscopy, from appropriate laser developments, to benchmark experiments to check the plausibilities in plasma measurements are described. B.W.

N85-18736# Tokyo Metropolitan Univ. (Japan). Dept. of Physics.
ONE-ELECTRON CAPTURE PROCESSES BY HIGHLY CHARGED IONS FROM HELIUM: PRESENT STATUS OF HICE-IPP
Yozaburo Kaneko *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 68-77 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

A series of experimental studies of one-electron capture processes from He by various multi-charged ions has been made. The purpose of it is not only produce atomic data useful for the fusion research but also to deepen the understanding of the physics of electron capture process by multi-charged ions. Measurements of total cross sections and translational energy spectroscopy of capturing ions were made for fully-stripped, H-like, He-like, Li-like and B-like ions of C, N, O, F, Ne and S. Recently, the experimental study has been extended to multi-charged ions of Kr(q+) up to q = 25 and Iq(+) up to q = 41. Experimental data are reported. B.W.

N85-18737# Hiroshima Univ. (Japan). Dept. of Applied Physics and Chemistry.
MEASUREMENTS OF ELECTRIC FIELDS IN PLASMAS BY USING BEAM PROBE AND LASER FLUORESCENCE TECHNIQUES
T. Oda, T. Usui, K. Takiyama, T. Fujita, Y. Kamiura, and K. Kawasaki (Okayama Univ., Japan) *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 78-82 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

Radial distribution of static electric field in a hollow cathode discharge has been obtained from a spectroscopic technique. Application of this method with the aid of laser fluorescence and beam probe techniques is discussed for measurement of weaker fields in large devices. Author

N85-18738# Osaka Univ. (Japan). Plasma Physics Lab.
BEAM PROBE SPECTROSCOPIC TECHNIQUE FOR ION TEMPERATURE AND MAGNETIC FIELD MEASUREMENTS
Yoshifumi Ito, Seiichi Goto, and Tsutomu Ishimura *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 83-88 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

One of the most important plasma diagnostics using neutral beam probe spectroscopy is reliable measurement of time- and space- resolved ion temperature of plasmas. For the shake of this active plasma diagnostics, a high density pulsed neutral beam source by use oof a z-pinch plasma gun was developed. This source can yield a hydrogen beam with energy approx 400 eV, density approx 3 x 10 to the 12th power/cu cm. and pulsed width approx 1.5 micro s at a position 60 cm away from the gun region. When the hydrogen beam with the energy in a region from 100 KeV is injected into the hydrogen plasma, main interaction process between the beam and the plasma particles (ions and electrons) is charge exchange interaction and its cross=section sigma ct is almost constant over this energy region (sigma ct approx 2 x 10 to the minus 15th power/sq cm). The charge exchange neutrals generated by this probing beam are almost atoms in ground state and they emit spectral lines via electron impact excitation process. B.W.

N85-18739# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DENSITY MEASUREMENTS OF ATOMIC HYDROGEN IN NBT-IM BY LASER-INDUCED FLUORESCENCE SPECTROSCOPY
K. Tsuchida *In its* Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 89-94 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The H sub alpha laser fluorescence diagnostics applied to the Bumpy Torus is described. The measurement yields local densities of hydrogen atoms in a high density plasma produced by an Ion Cyclotron Resonance (ICR) heating with a gas puffing. The result shows that the energy confinement time and the power loss due to the charge exchange process of plasma ions are 2.8 ms and 21 kW, respectively. E.A.K.

N85-18740# Kyoto Univ. (Japan). Dept. of Engineering Science.
LASER-INDUCED-FLUORESCENCE-SPECTROSCOPY OF ATOMIC PROCESSES UNDER A HIGH MAGNETIC FIELD
Takashi Fujimoto and Atsumi Kirabayashi *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 95-98 ref (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

Several teslas of magnetic field are expected in the next generation Tokamaks. Under such a high magnetic field, some of the atomic parameters, lake, the excitation cross section, may differ from those determined under a field free condition. An example of the atomic processes that depend strongly on the magnetic field strength are discussed. The excitation transfer between the singlet and triplet states of neutral helium due to atomic collision: is shown. It is found that one third of the single triplet excitation transfer is caused by the mixing of the atomic wave functions. It appears that the increase in the rate coefficients against an increase in the field strength have some correlation with the increase in the mixing of the atomic wave functions. Author

N85-18741# Texas Univ., Austin. Fusion Research Center.
TRANSPORT EXPERIMENTS IN THE TEXAS EXPERIMENTAL TOKAMAK Abstract Only
William L. Rowan *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 99 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The transport of an impurity injected into TEXT was investigated through measurement and simulation of radial distributions of the impurity and measurement of global confinement time. An experiment was conducted for a plasma current of 300 kA, a toroidal field of 28 kG, and a chord averaged electron density near 3.5 x 10 to the 13th power/cu cm. This resulted in temporally resolved,

radial distributions for Sc (+12) through Sc (+18) as well as a complete description of the background plasma. The data were numerically simulated by an impurity flux which is the sum of diffusive and convective terms. The global impurity confinement time was observed for all discharges with a wide range of toroidal fields but constant plasma current and density. It is found that, the impurity confinement time increases with decreasing toroidal field. An analytical description of transport which employs the same flux as the numerical simulation is used to estimate the adjustable transport parameters. E.A.K.

N85-18742# National Bureau of Standards, Gaithersburg, Md.
RADIATION DATA AND STANDARDS FOR TOKAMAK DIAGNOSTICS Abstract Only
W. L. Wiese *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 100 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

Spectral data and radiometric standards needed for Tokamak diagnostics are reviewed. The availability and quality of atomic energy levels, ionization energies, wavelengths, and transition probabilities are discussed. Areas in need of improvement are pointed out, and it is shown how interpolation techniques and applications of systematic trends may assist in situations where no numerical data are available. The status of VUV radiometry is reviewed, and transfer standards permitting in-situ calibrations are discussed. E.A.K.

N85-18743# Nagoya Univ. (Japan). Dept. of Astrophysics.
IMPACT OF ATOMIC DATA ON TOKAMAK MODELING
S. Hayakawa *In its* Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 101-104 (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The effect of impurities on Tokamak devices was investigated. Two branches with positive gradients represent an increase in the radiation loss rate. The density distributions measured with radial profiles of allowed lines show impurity ion transport in Tokamaks. The importance of spectroscopic measurements and their interpretation by atomic data is emphasized. Plasma parameters as functions of position and time are analyzed. A data base of atomic processes in plasmas, which includes cross sections and rate coefficients of direct collisional ionization and excitation for most target ions which take part in plasmas, is established. E.A.K.

N85-18744# Japan Atomic Energy Research Inst., Tokai. Dept. of Physics.
COMPILATION OF ATOMIC DATA FOR DIAGNOSTICS OF TOKAMAK
Yohta Nakai, Toshizo Shirai, and Kunio Ozawa *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 105-110 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The JT-60, a large Tokamak with a plasma volume of 60 cu m, is in the final stage of construction and will be in operation in April of 1985. Compilation and evaluation of atomic and molecular (A&M) data relevant to plasma diagnostics were examined. The present status on the compilation and evaluation of atomic structure and collision data for plasma diagnostics which are stored in the computer system is reviewed. E.A.K.

N85-18745# Kyoto Univ. (Japan). Dept. of Engineering Science.
IDENTIFICATION OF SPECTRA OF HIGHLY IONIZED Mo, Nb, Zr AND Y ATOMS
Keishi Ishii and Kozo Ando *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 111-115 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The spectroscopic data of molybdenum, which is one of the structural materials for fusion reactors were identified. The highly ionized molybdenum atom was emphasized, and Nb, Zr, and Y elements were studied to support the correct identification of Mo spectra. Spectra of 3d(g)-3d(8) 4f transition in Y XIII through Mo XVI were studied. Thirty three lines and 27 levels in MO XVI spectra were identified, and the same number of levels and lines were also identified in NbXV, in Zr XIV and in Y XIII. The identification was made with the aid of theoretical calculations which employ the Slater-Condon theory of atomic structure. The theoretical spectrum generated by plotting gf-values as a function of wavelength is shown for Mo XVI, together with observed spectra. E.A.K.

N85-18746# Institute of Physical and Chemical Research, Saitama (Japan).
BEAM-FOIL SPECTROSCOPY OF HIGHLY IONIZED ALUMINUM ATOMS
K. Ando, S. Komoto, M. Tonuma, H. Kumagai, Y. Awaya, S. Tsurubuchi (Tokyo Univ. of Agriculture and Technology, Japan), and K. Sato (Nagoya Univ., Japan) *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 116-121 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

The data of spectral lines, energy levels and life expectancy of aluminum ion were analyzed. An aluminum ion spectrum of average change is shown. the empherical Elden formula was employed to identify the spectral lines. Spectral lines were observed for transitions of f-electrons, in He-and Li-like ions. It is shown that the estimated value is close to the 3-D states and that the spectral lines from 3-D states are stronger than those from the 1-D state. Newly identified spectral lines and energy values of reported levels are presented. E.A.K.

N85-18747# Institute of Space and Astronautical Science, Tokyo (Japan).
THE COORDINATED RESEARCH PROGRAM AT IAEA ON ATOMIC COLLISION DATA FOR PLASMA DIAGNOSTICS
Yukikazu Itikawa *In* Nagoya Univ. Proc. on US-Japan Workshop on Tokamak Diagnostics by X-ray, VUV and Optical Radiations Nov. 1984 p 122-126 refs (For primary document see N85-18719 09-75)
Avail: NTIS HC A07/MF A01

Evaluated data sets of atomic collision data were generated in accordance with requirement priorities determined by the fusion community were generated. The collision processes the highest priority are: (1) electron impact excitation of ions; (2) electron impact ionization of the ions; and (3) charge exchange, and related processes like dielectronic recombination, ion impact ionization. The current status of the relevant data and recommendations are presented. It is recommended that cross sections for collision processes are used for diagnositcs and plasma modeling. E.A.K.

N85-18748# Naval Research Lab., Washington, D. C.
THE PLASMA ASSISTED MODIFIED BETATRON Interim Report
W. M. Manheimer 27 Dec. 1984 28 p
(AD-A148728; NRL-MR-5459) Avail: NTIS HC A03/MF A01 CSCL 20/7

It is shown that the presence of a very tenuous background plasma can improve the performance of a modified betatron with respect to the problems of injection, diamagnetic to paramagnetic transition, and resistive wall instability. Several physics issues relating to this background plasma are discussed. GRA

N85-18749# Los Alamos Scientific Lab., N. Mex.
DESIGN AND CONSTRUCTION DETAILS OF THE FRX-C/T DEVICE: A COMPACT TOROID PLASMA TRANSLATION EXPERIMENT
D. J. Rej Aug. 1984 17 p refs
(Contract W-7405-eng-36)
(DE85-001527; LA-10108-MS) Avail: NTIS HC A02/MF A01

The engineering design and construction details for the compact toroid plasma translation experiment FRX-C/T are

reviewed. A translation region consisting of a 0.4-m-i.d., up to 6-m-long metallic vacuum chamber was added onto one end of the field-reversed theta-pinch device FRX-C. A 2.5-MW, dc-powered, water-cooled solenoid magnet produces an axial magnetic field of up to kG in this region. A complete directory of all related engineering drawings is also included. DOE

N85-18750# Oak Ridge National Lab., Tenn.
MHD EQUILIBRIUM AND STABILITY FOR STELLARATOR/TORSATRON CONFIGURATIONS
B. A. Carreras, J. L. Cantrell, L. A. Charlton, L. Garcia, J. H. Harris, T. C. Hender, H. R. Hicks, J. A. Holmes, J. A. Rome, and V. E. Lynch 1984 8 p refs Presented at the 10th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., London, 12 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001139; CONF-840910-16) Avail: NTIS HC A02/MF A01

The stellarator equilibrium and stability studies presented are concentrated in two areas: the improvement of the understanding of high beta torsatrons through the concept of flux control and the study of helical axis configurations. Author

N85-18751# Los Alamos Scientific Lab., N. Mex.
COOKBOOK FOR DETERMINING ESSENTIAL TRANSMISSION CHARACTERISTICS OF SPHERICAL SECTION ELECTROSTATIC ANALYZERS
J. T. Gosling, M. F. Thomsen, and R. C. Anderson Jul. 1984 157 p
(Contract W-7405-eng-36)
(DE85-001404; LA-10147-M) Avail: NTIS HC A08/MF A01

Spherical section electrostatic analyzers are commonly used for the in situ measurement of plasmas in space. The geometric factor and response characteristics of such analyzers are complex functions of the analyzer bending angle, the entrance aperture size, the radius of curvature of the analyzer plates, and the positions and sizes of the sensing elements. Equations, figures, and plots are provided that define the geometric factor and response characteristics of spherical section electrostatic analyzers as functions of the analyzer geometry. DOE

N85-18752# Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
PLASMA SURFACE INTERACTION PROCESSES AND POSSIBLE SYNERGISMS
R. Behrisch and J. B. Roberto (ORNL) Aug. 1984 5 p refs Presented at the Workshop on Synergistic Effects in Surface Phenomena Related to Plasma-Wall Interactions, Nagoya, Japan, 21 May 1984
(Contract DE-AC05-84OR-21400)
(DE85-001861; CONF-840534-3) Avail: NTIS HC A02/MF A01

The process determining the plasma experiments are investigated following several lines. First, in plasma devices, the particle and energy fluxes to the different first wall areas the fluxes from the walls back into the plasma are measured and the boundary plasma parameters are determined. The surface composition and structure of the walls, limiters and divertor plates are analyzed following exposure to many discharges. Secondly, the different surface processes which are expected to contribute to the plasma surface interaction (particularly to hydrogen particle balance and impurity introduction) are studied in simulation experiments using well defined particle beams. DOE

N85-18753# Los Alamos Scientific Lab., N. Mex.
MAGNETIC DIVERTOR DESIGN FOR THE COMPACT REVERSED-FIELD PINCH REACTOR
C. G. Bathke, R. L. Miller, and R. A. Krakowski 1984 10 p refs Presented at the 13th Symp. on Fusion Technol., Varese, Italy, 24 Sep. 1984
(Contract W-7405-eng-36)
(DE85-002031; LA-UR-84-2980; CONF-840915-4) Avail: NTIS HC A02/MF A01

A recently completed design of a pumped-limiter-based Compact Reversed-Field Pinch Reactor is used to estimate for the first time the impact of magnetic divertors. A range of divertor options for the low-toroidal-field RFP is examined, and a design selection is made constrained by consideration of field ripple (magnetic island), blanket displacement, recirculating power, cost, heat flux, and access. Design choices based on diversion of minority (toroidal) field lead to a preference for (poloidally) symmetric or bundle divertor geometries. DOE

N85-18754# GA Technologies, Inc., San Diego, Calif.
EXTENDED ABSTRACT: ERGODIC MAGNETIC LIMITER EXPERIMENTS ON TEXT WITH A 7/3 RESONANCE
J. S. deGrassie, N. Ohyabu, and N. H. Brooks May 1984 20 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14 May 1984 Submitted for publication Prepared in cooperation with Texas Univ., Austin
(Contract DE-AT03-84ER-51044)
(DE85-001390; GA-A-17579; CONF-840520-23) Avail: NTIS HC A02/MF A01

The ergodic magnetic limiter coils on TEXT were reconfigured to produce the primary helical perturbation resonance at m = 7 / n = 3. The experiments continue to demonstrate that the weak resonant perturbations modify the edge conditions in keeping with model predictions. A reduction in the intrinsic impurity levels accompanying the helical current pulse was observed, presumably the result of a reduction in the electron temperature in the edge. Heat follows the perturbed field lines to the limiter, generating heat load patterns which reflect the geometry of a magnetic island - limiter intersection. A strong spatial modulation of the electron density in the scrape-off-layer also reflects the helical mode structure. DOE

N85-18755# Wisconsin Univ., Madison. Dept. of Physics.
DISCHARGE INITIATION EXPERIMENTS IN THE TOKAPOLE II TOKAMAK Ph.D. Thesis
David Adna Shepard Jun. 1984 114 p refs
(Contract DE-AC02-76ET-53051)
(DE84-017345; DOE/ET-53051/69) Avail: NTIS HC A06/MF A01

Experiments in the Tokapole II Tokamak demonstrate the benefits of high density (n/sub e/ /n0 greater than or equal to 0.01) preionization by reducing four quantities at startup: necessary toroidal loop voltage (V1) (50%), volt-second consumption (40 to 50%), impurity radiation (25 to 50%), and runaway electron production (approx. 80 to 100%). A zero-dimensional code models the loop voltage reduction dependence on preionization density and predicts a similar result for reactor scale devices. The code shows low initial resistivity and a high resistivity time derivative contribute to loop voltage reduction. The power balance of the ECR plasma in a toroidal-field-only case was studied. Langmuir probes and impurity doping were used. The vertical electric field (E/sub v/) and current (I/sub v/), which result from curvature drift, were measured (E/sub v/ approx. 10 V/cm and I/sub v/ approx. 50 Amps) and exceeded expected values for the bulk electron temperature (approx. 10 eV). A series of experiments with external windings to simulate field errors perpendicular to the toroidal field was done. The results imply that an error field of 0.1% of the toroidal field is deleterious to ECR plasma density. DOE

N85-18756# Texas Univ., Austin. Inst. for Fusion Studies.
DIFFUSION OF PARTICLES IN A SLOWLY MODULATED WAVE
John R. Cary (Colorado Univ., Boulder), D. F. Escande (Ecole Polytechnique, France), and J. L. Tennyson Aug. 1984 19 p refs
(Grant DE-FG05-80ET-53088)
(DE85-000729; DOE/ET-53088/155) Avail: NTIS HC A02/MF A01

Particle motion in a slowly modulated wave was studied. Recent results for the change in the adiabatic invariant due to separatrix crossing are used to calculate the diffusion coefficient for the adiabatic invariant of a particle moving in an amplitude modulated

wave. It is argued that the calculated scaling also holds for the case of a narrow spectrum wave field. The present scaling law due to adiabatic invariant jumps, D/sub J approx. k/sub O/(DELTA) v/sub phi/(3), differs substantially from the resonance broadening theory result D/sub RB/ approx. W/sub O/sub 3/4/k/sub O/sup 1/2/, where (DELTA) v/sub phi/ is the spectral width of the phase velocity, and W/sub O/ is the energy density of the wave fields. DOE

N85-18757# Oak Ridge National Lab., Tenn.
ELECTRON-HOLE PLASMA FORMATION IN SEMICONDUCTORS DUE TO THE ABSORPTION OF PULSED CO2 LASER LIGHT
R. B. James Jan. 1984 18 p refs Presented at the 6th Intern. Conf. on Lasers and Applications, San Francisco, Calif., 12 Dec. 1983
(Contract DE-AC05-84OR-21400)
(DE85-001559; CONF-831265-6) Avail: NTIS HC A02/MF A01

The modification of carrier distribution due to high-intensity CO2 laser radiation is considered for several semiconductors. The steady-state carrier temperature is calculated as a function of the light intensity by equating the rate at which the carriers receive energy from the electromagnetic field and the rate at which the carriers lose energy to the lattice by the emission of phonons. For sufficiently high light intensities, a significant fraction of the total free carrier density can have a kinetic energy which exceeds the bandgap. These hot carriers are energetically capable of relaxing by undergoing an inelastic pair-producing scattering event. This impact ionization process can lead to the formation of a laser-induced plasma by the absorption of light well below the bandgap of the material. Explicit values are presented for the intensity thresholds at which the impact ionization processes become important for light in the 9- to 11- micrometer region. DOE

N85-18758# Texas Univ., Austin. Fusion Research Center.
EXPERIMENTAL INVESTIGATIONS OF DRIVEN ALFVEN WAVE RESONANCES IN A TOKAMAK PLASMA USING CARBON DIOXIDE LASER INTERFEROMETRY Ph.D. Thesis
Todd Edwin Evans Sep. 1984 189 p refs
(Contract DE-AC05-78ET-53043)
(DE85-001049; DOE/ET-53043/12) Avail: NTIS HC A09/MF A01

The first direct observation of the internal structure of driven globed Alfven eigenmodes in a Tokamak plasma is presented. A carbon dioxide laser scattering/interferometer has been designed, built, and installed on the PRETEXT Tokamak. The resonance conditions required for, and the spatial wave field structure of, driven plasma eigenmodes at frequencies below the ion cyclotron frequency in a confined, high temperature, Tokamak plasma are investigated. DOE

N85-18759# Michigan Univ., Ann Arbor. Dept. of Nuclear Engineering.
EFFECT OF ALPHA PARTICLES ON THE STABILITY OF ELMO BUMPY TORUS (EBT) REACTOR Final Report
D. Wojtowicz and Terry Kammash 1984 34 p refs
(Contract DE-AC02-76ET-53003)
(DE84-017266; DOE/ET-53003/1) Avail: NTIS HC A03/MF A01

The macroscopic stability of an ignited EBT reactor is investigated by studying the effects of the alpha particles generated by the Deuterium-Tritium (D-T) fusion reaction on the background interchange mode, the interacting interchange mode, and the high-frequency compressional Alfven and coupled modes. A fluid description is used for the background plasma while a kinetic treatment is utilized for the hot electron species and the alpha particles. It is shown that the alphas tend to mildly destabilize the interacting interchange while stabilizing the background interchange due to their sizable Larmor radii. The destabilization is most pronounced when the beta of the alpha particles in highest, i.e., at birth, and recovery of stabilization takes place as these particles slow down toward thermalization. The alpha completely stabilize the high frequency modes so that fusion alphas present no detrimental effects on the stability of an EBT reactor that possesses an appropriate hot electron ring for macroscopic stability. DOE

N85-18760# California Univ., Livermore. Lawrence Livermore Lab.
LONG-PULSE BEAMLINES FOR THE MIRROR FUSION TEST FACILITY
R. R. Stone, A. I. Goldner, and P. Poulsen 5 Sep. 1984 7 p refs Presented at the 13th Symp. on Fusion Technol., Varese, Italy, 24 Sep. 1984
(Contract W-7405-eng-48)
(DE84-017091; UCRL-90619; CONF-840915-1) Avail: NTIS HC A02/MF A01

Test results were recently obtained indicating that a beam of pure full-energy deuterium particles can be delivered to the plasma targets in MFTF-B. A close-coupled separator magnet with the ion source was used to separate the impurities from the full-energy deuterium particles. The completed studies show that the usual iron-core sweep magnet and shielding used in neutral beamlines can be eliminated and the gas flow out of the beamline decreased. This design also reduces beam losses. Smooth-bore OFHC tube arrays brazed to manifolds will be used for the active heat transfer surfaces. Tests indicate that both burnout and life requirements are met by this design. Test results were presented and the MFTF-B long-pulse beamline configuration was discussed. DOE

N85-18761# Oak Ridge National Lab., Tenn.
HEAT TRANSFER AND MECHANICAL INTERACTIONS IN FUSION NUCLEAR SYSTEMS
R. E. Nygren 1984 11 p refs Presented at ASME Winter Ann. Meeting, New Orleans, La., 9 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-016233; CONF-841291-14) Avail: NTIS HC A02/MF A01

This general review of design issues in heat transfer and mechanical interactions of the first wall, blanket and shield systems of Tokamak and mirror fusion reactors begins with a brief introduction to fusion nuclear systems. The design issues are summarized in tables and the following examples are described to illustrate these concerns: the surface heating of limiters, heat transfer from solid breeders, MHD effects in liquid metal blankets, mechanical loads from electromagnetic transients and remote maintenance. DOE

N85-18762# Illinois Univ., Urbana. Fusion Studies Lab.
CTR PLASMA ENGINEERING STUDIES Annual Progress Report, 1 Nov. 1983 - 30 Oct. 1984
George H. Miley 1984 148 p refs
(Contract DE-AC02-76ET-52040)
(DE84-017447; DOE/ET-52040/T21; COO-2218-307) Avail: NTIS HC A07/MF A01

Research in several areas is reported including: (1) transport in compact tori; (2) bremsstrahlung energy deposition in first wall materials, (3) Coulombic energy transfer collisions; (4) magnetic helicity injection study; (5) blankets for tritium catalyzed deuterium fusion reactors; (6) exploratory studies of applications of optimal control theory; (7) design of a burn dynamic experiment; (8) alpha driven low frequency fast magnetosonic wave microinstability in tandem mirror; (9) fusion product heating and confinement in a tandem mirror; and (10) velocity-space particle loss in field reversed configurations. DOE

N85-18763# Brookhaven National Lab., Upton, N. Y. Physics Dept.
VERY HIGH ENERGY PROBES OF THE QUARK-GLUON PLASMA
Thomas Ludlam, F. Paige, and L. Madansky (Johns Hopkins Univ., Baltimore) 1984 7 p refs Presented at the Workshop on Detectors for Relativistic Nuclear Collisions, Berkeley, Calif., 26 Mar. 1984
(Contracts DE-AC02-76CH-00016; DE-AC02-76ER-03274)
(DE84-016992; BNL-35107; CONF-8403137-1) Avail: NTIS HC A02/MF A01

Among the penetrating probes of nuclear matter the most

frequently discussed are those which involve the detection of photons or leptons with m(sub T) approx. = P(sub T) < 3 GeV. This is the expected range of emission from a hot, thermalized plasma of quarks and gluons. The suggestion has been made that in very high energy collisions of nuclei the properties of high P(sub T) jets may also reflect the characteristics of the nuclear medium through which the parent partons have propagated just after the collision. The possible uses of such a probe are examined. DOE

N85-18764# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.
MAGNETIC FUSION ENERGY PLASMA INTERACTIVE AND HIGH HEAT FLUX COMPONENTS. VOLUME 2: TECHNICAL ASSESSMENT OF THE CRITICAL ISSUES AND PROBLEM AREAS IN HIGH HEAT FLUX MATERIALS AND COMPONENT DEVELOPMENT
M. A. Abdou, R. D. Boyd, J. R. Easor, W. B. Gauster, J. D. Gordon, R. F. Mattas, G. D. Morgan, M. A. Ulrickson, R. D. Watson, W. G. Wolfer et al Jun. 1984 204 p refs 2 Vol.
(DE85-001155; UCLA/PPG-815) Avail: NTIS HC A10/MF A01

A technical assessment of the critical issues and problem areas for high heat flux materials and components (HHFMC) in magnetic fusion devices shows these problems to be of critical importance for the successful operation of near-term fusion experiments and for the feasbility and attractiveness of long-term fusion reactors. Aspects considered include: (1) source conditions; (2) systems integration; (3) materials and processes; (4) thermal hydraulic; (5) thermomechanical response; (6) electromagnetic response; (7) instrumentation and control; and (8) test facilities. The details of the technical assessment are presented and primary technical issues and needs for each area are highlighted. DOE

N85-18765# Sandia Labs., Albuquerque, N. Mex.
BRIEF OUTLINE OF ANALYTIC STABLITY STUDIES OF MAGNETICALLY INSULATED SYSTEMS
J. A. Swegle Sep. 1984 18 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000212; SAND-84-1760) Avail: NTIS HC A02/MF A01

Twenty-five publications related to the analytic investigation of the linear stability of magnetically insulated systems are reviewed. The research work described is summarized from the point of view of laminar flow, nonlaminar electron flow, and sheath-electrode plasma interaction. DOE

N85-18766# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTATIONAL PLASMA PHYSICS AND SUPERCOMPUTERS
J. Killeen and B. McNamara Sep. 1984 32 p refs Presented at the Meeting on Plasma Phys., Trieste, Italy, 24 Sep. 1984
(Contract W-7405-eng-48)
(DE85-001739; UCRL-91511; CONF-840932-2) Avail: NTIS HC A03/MF A01

The supercomputers of the 80's are introduced. They are 10 to 100 times more powerful than today's machines. The range of physics modeling in the fusion program is outlined. New machine architecture will influence particular codes, but parallel processing poses new coding difficulties. Increasing realism in simulations will require better numerics and more elaborate mathematics. DOE

N85-18767# Wisconsin Univ., Madison. Dept. of Physics.
EFFECTS OF q AND HIGH BETA ON TOKAMAK STABILITY
N. S. Brickhouse, J. D. Callen, R. N. Dexter, D. E. Graessle, D. Kortbawi, R. A. Moyer, T. H. Osborne, S. C. Prager, J. S. Sarff, J. C. Sprott et al Aug. 1984 11 p refs Presented at the 10th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., London, 12 Sep. 1984 Prepared in cooperation with Columbia Univ., N.Y.
(Contract DE-AC02-76ET-53051)
(DE84-016650; DOE/ET-53051/70; CONF-840910-9) Avail: NTIS HC A02/MF A01

In the Columbia University Torus 2 Tokamak plasmas have been studied with volume averaged toroidal beta values as high as 15%. Experimental equilibria have been compared with a 2D free boundary MHD equilibrium code PSEC. The stability of these equilibria has been computed using PEST, the predictions of which are compatible with an observed instability in Torus 2 which may be characterized as a high toroidal mode number ballooning fluctuation. In the University of Wisconsin Tokapole 2 Tokamak disruptive instability behavior is investigated, with plasma able to be confined on closed magnetic surfaces in the scrape-off region, as the cylindrical edge safety factor is varied from q approx. 3 to q approx. 0.5. It is observed that at g/sub a/ approx. 3 major disruption activity occurs without current terminations, at g/sub a/ less than or equal to 2 well-confined plasmas are obtained without major disruption, and at g/sub a/ approx. 0.5 only partial reconnection accompanies minor disruptions. DOE

N85-18768# Oak Ridge National Lab., Tenn.
BACKGROUND CALCULATIONS FOR THE MEASUREMENT OF THE ION TEMPERATURE IN A DEUTERIUM PLASMA
R. G. Alsmiller, Jr., R. T. Santoro, J. F. Manneschmidt, and J. M. Barnes Jul. 1984 15 p refs
(Contract DE-AC05-84OR-21400)
(DE84-016546; ORNL/TM-9230) Avail: NTIS HC A02/MF A01

The ion temperature of a deuterium plasma with a Maxwellian distribution may be determined by measuring the transmission of the D-D neutrons, i.e., neutrons produced by the reaction D + D (YIELDS) n + (3)He, through liquid oxygen. In practice the measurement requires both collimation and shielding to ensure that the attenuation of only those neutrons emitted directly from the plasma is measured. Calculated results are presented of the collimation and shielding required to reduce the background so that the ion temperature may be measured. The geometric configuration used in the calculations is that of the Impurity Studies Experiment (ISX) at the Oak Ridge National Laboratory, but the results will provide insight into the application of the measurement method at other plasma facilities. Results are presented for D-D plasma temperatures of 2, 6, and 10 keV and for two sizes of NE-213 detectors. It is concluded that the counting rates are too low to make the measurement feasibility at ISX. DOE

N85-18769# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
VERSATOR DIVERTOR EXPERIMENT: PRELIMINARY DESIGNS
A. S. Wan and T. F. Yang Aug. 1984 36 p refs
(Contract DE-AC02-78ET-51013)
(DE84-017159; DOE/ET-51013/111) Avail: NTIS HC A03/MF A01

The emergence of magnetic divertors as an impurity control and ash removal mechanism for future Tokamak reactors brings on the need for further experimental verification of the divertor merits and their ability to operate at reactor relevant conditions, such as with auxiliary heating. Preliminary designs of a bundle and a poloidal divertor for Versator II, which operates in conjunction with the existing 150 kW of LHRF heating or LH current drive are presented. The bundle divertor option also features a new divertor configuration which should improve the engineering and physics results of the DITE experiment. Further design optimization in both physics and engineering designs are currently under way. DOE

N85-18770# Pacific Northwest Lab., Richland, Wash.
DEVELOPMENT OF MATERIALS FOR OPEN-CYCLE MHD Quarterly Report for period ending Mar. 1984
D. D. Marchant and J. L. Bates Sep. 1984 22 p refs
(Contract DE-AC06-76RL-01830)
(DE84-017293; PNL-4001-7) Avail: NTIS HC A02/MF A01

Pacific Northwest Laboratory (PNL) is conducting a study of channel components for open-cycle, coal-fired magnetohydrodynamic (MHD) generators. Specifically, electrodes and insulators are being developed. The electrical conductivity was measured on several compositions based on indium oxide-tin oxide (In_2O_3-SnO_2). These compositions were studied as additives to refractory ceramic oxides to increase the low-temperature electrical conductiv-

ity. Indium oxide appears to be the main constituent required for high conductivity. The electrical conductivity of In2O3-SnO2 compositions increases with increasing In2O3 concentration and reaches a maximum with compositions containing about 95 mo% In2O3. These high In2O3-containing compositions behave like degenerate semiconductors; the electrical conductivity decreases with increasing temperature. Three major crystallographic phases were identified for each composition, and were tested for their relative electrical conductivity and corrosioin resistance to determine which phase would be most suitable for use as an additive to refractory ceramic oxides. DOE

N85-18771# Oak Ridge National Lab., Tenn. Fusion Energy Div.

STUDIES ON IMPURITY CONTROL AND HYDROGEN PUMPING WITH CHROMIUM GETTERING IN ISX-B

P. Mioduszewski, J. E. Simpkins, P. H. Edmonds, R. C. Isler, E. A. Lazarus, C. H. Ma, M. Murakami, and A. J. Wootton 1984 3 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14 May 1984

(Contract DE-AC05-84OR-21400)

(DE85-001896; CONF-840520-20) Avail: NTIS HC A02/MF A01

Chromium gettering has been proven to be a trouble-free and efficient method of surface pumping in Tokamaks. The impurity control capabilities are excellent and comparable to that of titanium. The hydrogen uptake is reduced to monolayer quantities on the surface. The expansion of the operating space is similar to that seen with titanium without the disadvantage of strongly increased hydrogen fluxes. Possible applications of chromium gettering are: impurity control in contemporary Tokamaks; surface pumping in short pulse DT-burning devices to minimize tritium inventory; and wall conditioning of future large machines prior to operation. DOE

N85-18772# FOM-Inst. voor Plasmafysica, Rijnhuizen, Jutphaas (Netherlands).

THE ENERGY SPECTRA OF SLOWED-DOWN NEUTRALS FROM THE HEATING BEAMS IN ASDEX Thesis - Utrecht Univ.

G. H. J. Notermans Jul. 1984 29 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)

(Rept-84-157) Avail: NTIS HC A03/MF A01

Measurements of the slowing-down spectrum of the ASDEX Tokamak heating beam are compared with predictions based on a numerical solution of the Fokker-Planck equation in a two-dimensional velocity space. The result is used to evaluate the charge exchange spectrum of confined beam particles, emerging from the plasma under various angles with respect to the magnetic field. This flux is compared with the yield stemming from direct scattering of the neutral beam particles on the plasma ions.

Author (ESA)

N85-18773# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

MULTIHOLE COUPLERS FOR OVERMODED WAVEGUIDE SYSTEMS

G. Janzen and H. Stickel Dec. 1983 30 p refs

(IPF-83-8) Avail: NTIS HC A03/MF A01

Directional couplers for transverse electric (TE) modes which selectively pick one mode from a mode mixture in an overmoded circular waveguide system are described. Unwanted modes are statistically nulled out in the coupling waveguide. Mode selectivity and directivity oscillate up and down with an increasing number of holes and finally reach 20 dB. A directional coupler for the TE02 mode (28 GHz, 63.4 mm circular waveguide) with 41 holes and a length of 1.6 m shows a directivity of 68 dB and suppresses TE01 with 58 dB, TE03 with 28 dB, TE04 with 34 dB, TE22 with 37 dB, and further modes TElm ($l<5$, $m<6$) with 17 to 34 dB. Author (ESA)

N85-18774# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

SHORT MODE SELECTIVE DIRECTIONAL COUPLERS

G. Janzen and H. Stickel Dec. 1983 23 p refs

(IPF-83-9) Avail: NTIS HC A02/MF A01

Short mode selective directional couplers for transverse electric (TE) modes travelling in overmoded circular waveguides are described. Directivity is achieved by pairs of holes with destructive interference in backward direction, unwanted modes are suppressed by destructive interference in either direction of the coupling guide. A 28 GHz narrow band directional coupler for the TE01 mode (63.4 mm waveguide diameter) with 16 holes and length 230 mm shows a directivity of 55 to 100 dB between 27.9 and 28.1 GHz, suppressing the TE02 mode with 35 to 80 dB, the TE03 mode with 30 to 65 dB, and the TE22 mode with 30 to 70 dB. Author (ESA)

N85-18775# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

IMPROVED DIRECTIONAL COUPLERS FOR OVERMODED WAVEGUIDE SYSTEMS

G. Janzen and H. Stickel Jan. 1984 15 p refs

(IPF-84-1) Avail: NTIS HC A02/MF A01

Directional couplers for waveguides used in plasma heating of thermonuclear fusion devices were tested: TE11 coupler, 28 GHz, 40 mm dia; TE11, 70 GHz 27.79 mm; TE02, 60 GHz, 63.4 mm; and TE03, 28 GHz, 63.4 mm. Multihole couplers showing insufficient suppression of single modes or insufficient directivity can be improved by adding holes of a shifted coupler structure of the same kind. A shifted structure improving the directivity also enhances suppression of unwanted modes propagating in backward direction. Marked suppression of a single unwanted backward mode also improves suppression of the other backward modes as well as directivity. Marked suppression of an unwanted mode in forward direction with very similar phase velocity to the desired mode can be problematic, because the desired mode amplitude may be considerably reduced by this measure. Author (ESA)

N85-18776# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

FOUR PHASE MODEL FOR TURBULENT INSTABILITIES CALCULATION IN PLASMA JETS [VIERFLUESSIGKEITS-BESCHREIBUNG TURBULENTER VORGAENGE IM PLASMA-FOKUS]

A. Hayd (Maschinenfabrik Augsburg-Nurenberg A.G., Munich, West Germany), H. J. Kaeppeler (Maschinenfabrik Augsburg-Nurenberg A.G., Munich, West Germany), M. Haurer (Maschinenfabrik Augsburg-Nurenberg, Munich, West Germany), and P. Meinke (Maschinenfabrik Augsburg-Nurenberg A.G., Munich, West Germany) Mar. 1984 22 p refs In GERMAN Presented at DPG-Fruehjahrstagung, Kiel, 21 Mar. 1984

(IPF-84-2) Avail: NTIS HC A02/MF A01

A two phase theory which describes the plasma compression, pinch and decay phase for the plasma generator POSEIDON in the range 280 kJ, 60 kV is presented. The REDUCE/FORTRAN hybricode calculation was made. This shows neutron production in the pinch phase. For dynamic calculation of the plasma jet, a four phase theory was derived to cope with macro and microturbulence. The results of both calculations were compared to experimental observations on POSEIDON. Author (ESA)

N85-18777# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

LIDAR-THOMSON SCATTERING Final Report, 15 Jun. 1984

G. Brederlow (Max-Planck Inst. fuer Quantenoptik), J. E. Gruber (Max-Planck Inst. fuer Plasmaphysik, Garching, West Germany), K. Hirsch, H. Roehr (Max-Planck Inst. fuer Plasmaphysik, Garching, West Germany), H. Salzmann, and K. J. Witte (Max-Planck Inst. fuer Quantenoptik) Jun. 1984 155 p refs

(Contract JE-3/9009)

(IPF-84-3; IPP-1/299) Avail: NTIS HC A08/MF A01

A lidar-Thomson scattering system was designed for the Joint European Torus. Spatial resolution of 12 cm is achieved using an iodine laser (15 J at 657 nm, 300 psec pulse duration) with microchannel plate photomultipliers and a 1 GHz oscilloscope. The statistical errors of the electron temperature and density

measurements for a 5 channel spectrometer with a dynamic range of 0.7 to 15 keV are smallest at 5 keV (2.6%). The feasibility of 1 Hz operation over a sequence of 10 shots is demonstrated. The design of a 15 J frequency-doubled laser system is considered. The stray light level to be expected was determined in a full scale optical set-up with a low energy, frequency doubled iodine laser. It is shown that stray light constitutes no problem for the Thomson scattering experiments due to the good gating properties of the detector. Even Rayleigh scattering measurements for absolute calibration at 1 Torr hydrogen filling pressure should be possible. Author (ESA)

N85-18778# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

FOUR-FLUID DESCRIPTION OF TURBULENT PLASMA FOCUS DYNAMICS

A. Hayd (Maschinenfabrik Augsburg-Nurenberg A.G., Munich, West Germany), H. J. Kaeppeler (Maschinenfabrik Augsburg-Nurenberg A.G., Munich, West Germany), M. Maurer (Maschinfabrik Augsburg-Nurenberg A.G., Munich, West Germany), and P. Meinke Jun. 1984 21 p refs

(IPF-84-4) Avail: NTIS HC A02/MF A01

A four-fluid system of dynamic equations was formulated and programmed with the REDUCE/FORTRAN code to calculate dynamic phenomena in the compression, pinch and late phases of the plasma focus experiment POSEIDON in its operational mode at 60 kV, 280 kJ. The four fluid theory includes macroturbulence, microinstabilities, and anomalous transport properties, as well as the runaway effect for electrons and ions. Calculation results are presented and are compared with previous calculations and with experimental observations. Author (ESA)

N85-18779# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

ELECTRON CYCLOTRON RESONANCE HEATING SYSTEM FOR THE STELLARATOR W 7-AS

R. Wilhelm, V. Erckmann, G. Janzen, W. Kasparek, G. Mueller, P. G. Schueller, K. Schwoerer, and M. Thumm Jul. 1984 30 p refs

(IPF-84-5) Avail: NTIS HC A03/MF A01

The physics and technology of an electron cyclotron resonance heating (ECRH) device for megawatt applications in a stellarator at up to 70 GHz are summarized. The system consists of a high voltage power supply, five RF generator modules, the transmission lines, the antennas for plasma irradiation, and diagnostics for measuring the RF power distribution. The system is an upgraded version of one under construction for the 70 GHz, 200 kW, 100 msec ECRH experiment on the W VII-A stellarator. This development benefits from the successful operation of the 28 GHz device which shows the feasibility of ECRH and of the technical hardware. Author (ESA)

N85-18780# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

HIGH POWER MILLIMETER-WAVE MODE CONVERTERS IN OVERMODED CIRCULAR WAVEGUIDES USING PERIODIC WALL PERTURBATIONS

M. Thumm Jul. 1984 41 p refs Presented at Intern. Symp. on Gyrotron Develop., Lausanne, Switzerland, 4-6 Jul. 1984

(IPF-84-6) Avail: NTIS HC A03/MF A01

Conversion of circular electric TE0n gyrotron mode compositions at 28 and 70 GHz to the linearly polarized TE11 mode is described. Mode transducers with axisymmetric radius perturbations transform the TE0n gyrotron mode mixture to TE01 mode for long-distance transmission through overmoded waveguides. A mode converter with constant diameter and periodically perturbed curvature transfers the unpolarized TE01 mode into the TE11 mode which produces an almost linearly polarized millimeterwave beam needed for efficient electron cyclotron heating of plasmas in thermonuclear fusion devices. The TE0n-to-TE01 conversion efficiency is 98+or-1% at 28 and 70 GHz, while the TE01-to-TE11 converter has a 96+or-2% conversion efficiency at 28 GHz and 94+or-2% at 70 GHz; ohmic losses are included. For TE16-to-TE12-to-TE11 mode conversion at 28 GHz by 2 periodically rippled wall mode converters, efficiencies are 92% and 95%, respectively. Author (ESA)

N85-18781# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

DESIGN OF MODE CONVERTERS FROM TE CIRCULAR OM MODES IN CIRCULAR WAVEGUIDES TO TE RECTANGULAR mo MODES IN RECTANGULAR WAVEGUIDES FOR HIGH POWER APPLICATIONS IN THE FREQUENCY RANGE 1 TO 30 GHz

Gerd Janzen Jul. 1984 16 p refs

(IPF-84-7) Avail: NTIS HC A02/HF A01

A mode converter for transitions from circular symmetric modes to rectangular waveguide modes and vice versa for high power applications in plasma heating experiments is described. The converter conserves the power of all circular symmetric modes emitted by a gyrotron and aligns the fields into linearly polarized modes required for effective plasma heating by electron cyclotron or by lower hybrid resonance absorption. It also allows a convenient combination of the power output of several klystrons and mode conversion into modes with low attenuation. Suitable combinations of waveguide diameter and number of sectors dividing (or combining) the power avoid the excitation of unwanted modes. Author (ESA)

N85-18782# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

WAVE ABSORPTION AND TRANSPORT STUDIES ON ELECTRON CYCLOTRON RESONANCE (ECR) HEATED STELLARATOR PLASMAS IN W 7-A

V. Erckmann, G. Janzen, W. Kasparek, G. Mueller, E. Raeuchle, P. G. Schueller, K. Schwoerer, M. Thumm, R. Wilhelm, D. Dorst et al Sep. 1984 16 p refs Presented at IAEA 10th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., London, 12-19 Sep. 1984 Submitted for publication Prepared in cooperation with Max-Planck Inst. fuer Plasmaphysik, Garching, West Germany

(IPF-84-9; IAEA-CN-44/D-I-5) Avail: NTIS HC A02/MF A01

Some OH-current free stellarator plasmas with attractive parameters were produced by irradiating intense, linearly polarized electron cyclotron resonance (ECR) waves launched in O-mode orientation into a stellarator from the torus outside in the TE11 or HE11 mode. The localized power deposition results in a very narrow electron temperature profile, but allows profile shaping by choosing off-axis EC resonance. Total absorption agrees well with single-pass O-mode absorption, even at extreme power densities and at conditions of fully relativistic absorption. Reflection of the non-absorbed O-mode power in X-mode orientation does not improve the overall heating efficiency, because of a local power absorption near the surface around the X-mode conversion layer caused by plasma density fluctuations. Optimum confinement of the stellarator plasma is achieved at irrational t-values. Author (ESA)

N85-18783# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

TWO PHASES OF NEUTRON PRODUCTION IN THE POSEIDON PLASMA FOCUS

H. Herold, L. Bertalot, K. Hirano, U. Jaeger, H. J. Kaeppeler, M. Sadowski, H. Schmidt, R. Schmidt, M. Shakhatre, A. Shyam et al Sep. 1984 21 p refs Presented at IAEA 10th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., London, 12-19 Sep. 1984 Submitted for publication Sponsored by Deutsche Forschungsgemeinschaft

(IPF-84-10; IAEA-CN-44/D-III-6-3) Avail: NTIS HC A02/MF A01

Measurements in the 280 kJ, 60 kV operational mode of the POSEIDON plasma focus confirm that at high pinch currents (1 MA) 2 phases of suprathermal neutron production exist. In the pinch phase, the neutron emission from a macroscopically smooth, relatively quiet thermal plasma column is probably caused by accelerated deuterons trapped for up to 100 nsec in the pinch by gyromotion and relaxation. Calculations suggest that the acceleration is due to an MHD instability induced reconfiguration process, leading to current filamentation and high Bz-fields. In soft X-ray

pictures, filaments, particularly a central filament, were observed. Indications for Bz-fields were deduced from the directions of the reaction proton trajectories. Irreproducible, strong neutron production in the second phase is associated with m = 0 pinch breakups and with fast deuterons accelerated mainly in axial direction.
Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-18784 Ohio State Univ., Columbus.
CRITICAL VELOCITIES IN He II FOR INDEPENDENTLY VARIED SUPERFLUID AND NORMAL FLUID VELOCITIES Ph.D. Thesis
Marie Levis Baehr 1984 243 p
Avail: Univ. Microfilms Order No. DA8426348

Experiments were performed to measure the critical velocity in pure superflow and compare to the theoretical prediction; to measure the first critical velocity for independently varied superfluid and normal fluid velocities; and to investigate the propagation of the second critical velocity from the thermal counterflow line through the V sub n,-V sub s quadrant. The experimental apparatus employed a thermal counterflow heater to adjust the normal fluid velocity, a fountain pump to vary the superfluid velocity, and a level sensing capacitor to measure the superfluid velocity. The results of the pure superfluid critical velocity measurements indicate that this velocity is temperature independent contrary to Schwarz's theory. It was found that the first critical velocity for independently varied V sub n and V sub s could be described by a linear function of V sub n and was otherwise temperature independent. It was found that the second critical velocity could only be distinguished near the thermal counterflow line. Dissert. Abstr.

N85-18785 Arkansas Univ., Fayetteville.
HIGH TEMPERATURE LASER INTERFEROMETRIC STUDIES OF SOLID ELECTROLYTES Ph.D. Thesis
Tarlok Singh Aurora 1983 266 p
Avail: Univ. Microfilms Order No. DA8426120

The dilatometric and optical properties of the alkaline earth fluorides, CdF2, PbF2 and sodium beta-alumina were investigated using a laser interferometer. The effect of temperature, in general, and the supersonic phase transition, in particular, on these properties was examined. The results indicate that the thermal expansion coefficient varies anomalously as the transition temperature is approached. A similar behavior is displayed in the thermal evolution of the thermooptic coefficient, the strain polarizability parameter, the variation in molecular polarizability and the refractive index with density. Among the alkaline earth fluorides, the variation in the thermooptic coefficient is apparently similar up to 1100 K and its value is larger for heavier cations. CdF2 and PbF2 depart from this trend. PbF2 and CdF2 display a similar departure in the variation of refractive index with density, molecular polarizability with temperature and the strain polarizability parameter.
Dissert. Abstr.

N85-18786 Dartmouth Coll., Hanover, N.H.
THERMALLY INDUCED QUASIPARTICLE BRANCH IMBALANCE IN THIN FILM SUPERCONDUCTORS Ph.D. Thesis
Paul Joseph Dolan 1984 148 p
Avail: Univ. Microfilms Order No. DA8425161

Thermoelectric effects in superconductors are quite different than in normal metals. One effect is the voltage difference generated between the normal electrons and the superelectrons by a temperature gradient in an electrically isolated thin film of superconductor, the thermally induced quasiparticle branch imbalance. The theoretical background of the effect is investigated, using a two fluid model for the quasiparticle-superelectron system, with attention being given to the question of thermal contact between the sample (thin Sn film) and the (sapphire) substrate. Sample fabrication, the experimental apparatus, and the scheme for making measurements using a SQUID picovoltmeter are described. The thermopower of Sn films in the normal state was measured to be between .19 and 1.4 nV/K, varying with the thickness of the film, a value which is considerably smaller than the bulk value of 20 nV/K. An experimental upper bound was placed on the branch imbalance voltage of 10 pV, which gives an upper bound for the thermopower of the normal electrons in the superconductor of 2 nV/K, in agreement with the theory presented. Dissert. Abstr.

N85-18787 Brown Univ., Providence, R. I.
A PICOSECOND POPULATION MODULATION STUDY OF NEAR INTERBAND RESONANCES IN SEMICONDUCTORS Ph.D. Thesis
Jonathan Henry Harris 1984 137 p
Avail: Univ. Microfilms Order No. DA8422433

The development of a picosecond excite-probe optical modulation technique with the ability to address the dynamic evolution of an optical excitation with high spectral and temporal sensitivity is presented. A theoretical probe spectral lineshape is derived for a reflected and transmitted probe beam in the case where free carriers are the excitation under investigation. Application of this technique to study electron confinement and interface lifetime in a molecular beam epitaxy (MBE) grown n-type Ga(x)In(1-x)P/GaAs/Ga(x)In(1-x)P double heterojunction is discussed. Time varying transmission spectra at 77 K examined near the E sub o + delta sub o transition in GaAs and near the fundamental edge in Ga(x)In(1-x)P (x + .47), following the injection of a small electron-hole population. The confining efficiency of the structure for electrons is directly demonstrated in conjunction with a measurement of the interface recombination velocity. Optical modulation spectroscopy is also employed to investigate bound exciton dynamics in the semimagnetic semiconductor Co(1-)Mn(x)Se(x = .10). Dissert. Abstr.

N85-18788 Brandeis Univ., Waltham, Mass.
THE FERMI SURFACE AND MOMENTUM SPACE DENSITIES OF FERROMAGNETIC Gd USING THE POSITRON TECHNIQUE Ph.D. Thesis
Kenneth Richard Hoffmann 1984 201 p
Avail: Univ. Microfilms Order No. DA8420771

Gd is a ferromagnetic rare earth metal. Neutron scattering and de Haas-van Alphen (dHvA) measurements, performed on magnetized samples, have yielded information on the majority and minority electrons. Band structure calculations were performed for both the paramagnetic and ferromagnetic states. From these calculations models of the Fermi surface were proposed. Using the angular correlation of annihilation radiation (ACAR) technqiue the positron-sampled momentum density and momentum space spin density of the electrons in gadolinium were investigated. The positron tends to annihilate with electrons whose spin is anti-parallel to its own. For a ferromagnetic sample that implies the majority and minority electrons can be preferentially sampled by obtaining distributions with the saturating magnetic field parallel and antiparallel to the positron's polarization. Using the theory developed by Berko and Mills. The momentum density and momentum space spin density were obtained from the measured distributions. Two dimensional projections of the densities were obtained with the point slit configuration. Each two dimensional projection corresponds to an integral through the three dimensional density. The apparatus has been described previously by Berko, Haghgooie, and Mader, and employs discrete NaI scintillators. Dissert. Abstr.

N85-18789 Cincinnati Univ., Ohio.
THEORY OF SILICON SUPERLATTICES: BAND STRUCTURE AND MOBILITY ENHANCEMENT Ph.D. Thesis
Srinivasan Krishnamurthy 1984 235 p
Avail: Univ. Microfilms Order No. DA8425390

Using complex band structure method, the transverse and longitudinal band structures of model Si-Sr (sub 1-x) Ge (sub x) and MOS superlattices systems were obtained over a wide range

of layer thickness d (11 < equal to d < or equal to 110A). In this method, the size of the Hamiltonian matrix does not increase with the layer thickness. For fixed d, the magnitude of band gap can be varied continuously by changing the concentration x in the Si-SI (sub 1-x) Ge (sub x) superlattice and the gate voltage Vs in the MOS superlattice. By varying d, the position of the conduction band edge can be changed and a direct band gap results < or equal to 44 A. The transverse electron and hole effective masses were calculated. On the basis of above obtained band structure of Si-Si (sub 1-x) Ge (sub x) superlattices, the relaxation time for the impurity scattering case is calculated. For the non-degenerate case, thermally averaged relaxation time is used to calculate the electron mobility. Since superlattice bands are closer, occupation of higher bands was considered to calculate the average mobility. Dissert. Abstr.

N85-18790 Ohio State Univ., Columbus.
TURBULENCE IN PURE SUPERFLUID FLOW Ph.D. Thesis
Lee Bruce Opatowsky 1984 276 p
Avail: Univ. Microfilms Order No. DA8426446

The properties of turbulent superflow in thermal counterflow in liquid He II were studied. The steady state vortex line density, length of vortex line per unit volume, was determined by measuring temperature differences, Delta T, produced across a flow channel during turbulent superflow. A wide range of superfluid velocities V(sub s), was generated in the flow channel by a fountain effect pump. Measured values of Delta T and V (sub s) for a range of temperatures were used to determine gamma (T), the temperature dependence of the vortex line density. The functional dependence of the line density on V (sub s) was also determined. The close agreement between the gamma values from both experiments showed that the vortex line density was independent of geometry. The excellent agreement between the experimental gamma values and those predicted by the Schwartz model suggested that turbulent pure superflow was homogeneous and provided the first experimental verification of the Schwartz model. Turbulent pure superflow was found to consist of a single homogeneous turbulent flow state in contrast to the three turbulent flow states and the geometry dependence inherent in thermal counterflow. Dissert. Abstr.

N85-18791*# Illinois Univ., Urbana-Champaign. Dept. of Electrical and Computer Engineering.
SEMICONDUCTOR SUPERLATTICE PHOTODETECTORS Semiannual Report, 1 Jul. - 31 Dec. 1984
S. L. Chuang, K. Hess, J. J. Coleman, and J. P. Leburton 1984 20 p refs
(Grant NAG1-500)
(NASA-CR-174347; NAS 1.26:174347; SAR-1) Avail: NTIS HC A02/MF A01 CSCL 20L

A superlattice photomultiplier and a photodetector based on the real space transfer mechanism were studied. The wavelength for the first device is of the order of a micron or flexible corresponding to the bandgap absorption in a semiconductor. The wavelength for the second device is in the micron range (about 2 to 12 microns) corresponding to the energy of the conduction band edge discontinuity between an Ae/(sub x)Ga(sub 1-x)As and GaAs interface. Both devices are described. B.G.

N85-18792# Army Materials and Mechanics Research Center, Watertown, Mass. Ceramics Research Div.
THE GROWTH OF LARGE DIAMETER SINGLE CRYSTALS BY VERTICAL SOLIDIFICATION OF THE MELT Final Report
Jaroslav L. Caslavsky Aug. 1984 27 p Presented at the 5th Intern. Summer School on Crystal Growth and Materials Research, Davos, Switzerland
(DA Proj. 1L1-62105-AH-42)
(AD-A148756; AMMRC-TR-84-34) Avail: NTIS HC A03/MF A01 CSCL 20/2

Growth of large diameter single crystals, especially of phases which melt at high temperatures and have a high specific gravity, is governed by conditions that quite differ from those which occur during the growth of crystals whose diameter does not exceed 50 mm. This paper defines and analyzes these special conditions and delineates their effect on crystal growth. It is also shown that in spite of the presence of negative factors which are inherent to the growth process of large diameter single crystals, these adverse factors, if recognized properly, can be brought under control to such a degree that the growth of large diameter single crystals can be achieved. The vertical solidification of melt method (VSOM) is described. This method produces large single crystals, even for binary mixtures with a steep liquidus. Neodymium-doped yttrium aluminum garnet (Nd:YAG) crystals have been grown 75 mm in diameter and 100 mm high. These crystals are also water clear. Both size and perfect crystallinity are important for application to lasers. Author (GRA)

N85-18793# Indiana Univ., Bloomington. Dept. of Chemistry.
COMPARATIVE STUDIES ON THE ELECTRONIC STRUCTURES OF W2(O2CH)4 AND W2(O2CH)4-(CH3)2 BY THE RELATIVISTIC X ALPHA-SW METHOD: A d3-d3 METAL DIMER WITH A QUADRUPLE METAL-METAL BOND?
M. D. Braydich, B. E. Bursten, M. H. Chisholm, and D. L. Clark 29 Nov. 1984 35 p Prepared in cooperation with Ohio State Univ., Columbus Submitted for publication
(Contract N00014-79-C-0044)
(AD-A148814; INDU/DC/TR-84/3-MC) Avail: NTIS HC A03/MF A01 CSCL 07/2

The bonding in W2(O2CR)4 and in the recently characterized W2(O2CR)4R'2 molecules are compared via Xalpha-SW calculations with quasi-relativistic corrections on the model system W2(O2CH)4 (I) and W2(O2CH)4(CH3)2 (II). Several questions concerning the electronic structure of II have been addressed; in particular, the apparently strong W-W bond in the presence of strong W-C bonds was of interest. It has been found that II is best considered as a W2(O2CH)4 fragment interacting with two CH3 radicals, a description consistent with the photochemical decomposition of W2(O2CEt)4(CH2Ph)2. The resulting W-W bond still remains the essential component of the quadruple bond in I. The W-W bonding remains strong in spite of strong axial ligation because of involvement of a higher-lying s-s sigma bonding orbital, an orbital whose contribution is more important in II than in I. It is the presence of this orbital, which is lower-lying for third-row metals than for first, which is believed to account for the structural difference between CR2(O2CR)4L2 and the W2(O2CR)4R2 systems. GRA

N85-18794# Oak Ridge National Lab., Tenn.
FORMATION OF AMORPHOUS LAYERS IN Al2O3 BY ION IMPLANTATION
C. W. White, G. C. Farlow, C. J. McHargue, P. S. Sklad, and B. R. Appleton Jul. 1984 19 p refs Presented at the Ion Beam Modification of Mater. Conf., Ithaca, N.Y., 16 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001289; CONF-840760-14) Avail: NTIS HC A02/MF A01

Two methods are described which can be used to turn the near-surface region of Al2O3 amorphous by ion implantation. Epitaxial recrystallization of the amorphous region by thermal annealing is demonstrated. Changes in the physical and structural properties as a result of implantation are correlated with changes in the mechanical properties (microhardness). DOE

N85-18795# California Univ., Berkeley. Lawrence Berkeley Lab.
CALORIMETRIC INVESTIGATION INTO THE POSSIBILITY OF A CHARGE DENSITY WAVE GROUND STATE IN ALKALI METALS
J. VanCuren Aug. 1984 196 p refs
(Contract DE-AC03-76SF-00098)
(DE85-002006; LBL-18292) Avail: NTIS HC A09/MF A01

The heat capacities of potassium, rubidium, and cesium were measured in this apparatus down to 0.15 K. Anomalous features measuring a maximum of 1 to 5% were observed in the low temperature heat capacities of the samples. The maximum contributions occurred at 0.38 K in cesium, 0.55 K in rubidium, and 0.8 K in potassium. The temperature dependences of these features could be fit reasonably well by a phason heat capacity. If

the details of the phonon spectrum were unknown, this would lead to the conclusion that the alkali metal have a CDW ground state. On the other hand, a comparison of the results with a theoretical prediction for the phonon heat capacity based on a normal plane wave (PW) ground state suggests that these features, at least in potassium and rubidium, arise from complexities in the phonon vibrational spectrum. Thus it seems that potassium and rubidium are best described as having normal PW ground states. In contrast, the results for cesium agree best with the CDW model but the greater difficulty of calculating the normal phonon heat capacity leaves some doubt about this conclusion. DOE

N85-18796# California Univ., Berkeley. Lawrence Berkeley Lab.
SUB-EUTECTIC DENSIFICATION AND SECOND PHASE FORMATION IN Al2O3 - CaO
S. J. Wu and L. C. DeJonghe (California Univ., Berkeley) Jun. 1984 25 p refs Presented at the 86th Ann. Meeting of the American Ceramic Society, Pittsburgh, 2 May 1984
(Contract DE-AC03-76SF-00098)
(DE85-002065; LBL-17954; CONF-8405244-1) Avail: NTIS HC A02/MF A01

The early and intermediate densification stages of calcia containing alumina were examined at sub-eutectic temperatures. Up to 0.15% wt % calcia causes a decrease in the densification rates; from 0.15 to 0.7 wt % calcia an increasing densification rate is observed; and more than 0.75 wt % calcia leads to a montonically decreasing densification rate. The data are interpreted as a competition between grain-boundary defect chemistry, enhanced subeutectic densification, and formation of calcium-aluminate phases of lower calcia activity. DOE

N85-18797# Illinois Univ., Urbana. Dept. of Chemistry.
TRANSPORT AND RELAXATION PROCESSES IN SUPERCRITICAL FLUIDS Technical Progress Report, 1 Jul. - 30 Sep. 1984
J. Jonas 1984 13 p
(Contract DE-FG22-82PC-50800)
(DE85-002079; DOE/PC-50800/T8) Avail: NTIS HC A02/MF A01

Main emphasis was on design and testing of different modifications of the NMR solubility probe equipped with mixing. A new solution of the difficult problem of mixing in NMR probe at high pressure was proposed which should open new directions in supercritical fluid research. Experiments on supercritical CO2 were performed to examine collision induced scattering. The theoretical analysis of the data for SF6 and CH4 was completed, and the manuscript should be submitted for publication within the next grant period. The naphthalene/carbon dioxide solubility determination without mixing was initiated as described in the previous report. The first measurements were at 55 C and cover a range of pressures from 120 bar to 320 bar. The results are compared to the solubility data of Paulaitis, et al., and Reid, et al. Unfortunately, the data seems to be about 40% low at the higher pressures caused by diffusion of the naphthalene out of the sample cell while the equilibrium solubility is being obtained. This problem should be overcome with further sample cell design changes. B.G.

N85-18798# Illinois Univ., Urbana. Dept. of Chemistry.
TRANSPORT RELAXATION PROCESSES IN SUPERCRITICAL FLUIDS Technical Progress Report, 1 Apr. - 1 Jun. 1984
J. Jonas 1984 8 p
(Contract DE-FG22-82PC-50800)
(DE85-002076; DOE/PC-50800/T7) Avail: NTIS HC A02/MF A01

The technique for solubility measurements of solids in compressed supercritical fluids using NMR and theoretical analysis of experimental data on collision induced scattering were examined. Initial tests for a determination of solid solubilities in supercritical fluids without mixing were previously described and these preparations have continued. Super critical carbon dioxide dissolving naphthalene, for which solubility data is already available (M. McHugh, M.E. Paulaitis, J. Chem. Eng. Data, Vol. 25 (4), 1980) is being studied. This initial testing of the NMR technique for measuring solubilities in a well characterized system should prove very valuable for our later determinations with the proposed mixing probe. Systematic experimental studies of collision induced spectra in several supercritical fluids using both Raman and Rayleigh scattering are continued. The experimental work on SF6 and CH4 was finished and the experimental data testing of the various theoretical models for collision induced scattering is being analyzed. DOE

N85-18799# Sandia Labs., Albuquerque, N. Mex.
RADIATION EFFECTS IN STRAIND-LAYER SUPERLATTICE (SLS) STRUCTURES
C. E. Barnes, G. A. Samara, R. M. Biefeld, T. E. Zipperian, and G. C. Osbourn 1984 7 p refs Presented at Defects in Semiconductors Conf., Coronado, Calif., 12 Aug. 1984
(DE85-001713; SAND-84-0738C; CONF-840878-4) Avail: NTIS HC A02/MF A01

The effects of gamma and neutron irradiation on GaP/GaAsP strained-layer superlattices (SLS's) were studied and compared with results on similar non-SLS alloys. The carrier removal rate was significantly greater in the non-SLS samples for both types of radiation. Gamma irradiation resulted in layer-dependent removal rates which produced oscillations in the doping profile. Gamma-induced introduction rates of two prominent traps were the same in the various SLS samples, and in the non-SLS alloy. Thermal annealing was also similar in all the samples with the shallower (0.3 eV) trap recovering sharply in a stage at 175 C. This was accompanied by a disappearance of the carrier removal oscillations at a somewhat higher annealing temperature. In contrast, the degree of recombination-enhanced annealing, and its variation with applied hydrostatic pressure, was strongly dependent on sample characteristics. This type of recovery was much stronger in the non-SLS samples, and was dependent on the layer thicknesses in the SLS samples. DOE

N85-18800# California Univ., Berkeley. Lawrence Berkeley Lab.
INFLUENCE OF THE AMORPHOUS-CRYSTALLINE INTERFACE MORPHOLOGY ON DISLOCATION NUCLEATION IN PRE-AMORPHIZED SILICON
T. Sands, J. Washburn, R. Gronsky, W. Maszara, D. K. Sadana (North Carolina State Univ.), and G. A. Rozgonyi (North Carolina State Univ.) Aug. 1984 18 p refs Defects In Semiconductors Conf., Coronado, Calif., 12 Aug. 1984
(DE85-002068; LBL-18172; CONF-840878-3) Avail: NTIS HC A02/MF A01

Cross sectional high resolution transmission electron microscopy and secondary ion mass spectrometry are applied to the characterization of defects formed during rapid thermal annealing of pre-amorphized and subsequently BF2(+)-implanted (100) silicon substrates. The occurrence of hairpin dislocations is shown to be directly related to the degree of total disorder (i.e., amorphization) in the transition region between amorophous and crystalline material before annealing. A model for the nucleation and propagation of these dislocations is developed on the basis of the microscopy results. Finally, pre-amorphization conditions which minimize the density of hairpin dislocations are discussed. DOE

N85-18801# North Carolina State Univ., Raleigh.
AMORPHOUS MATERIALS AND RECRYSTALLIZATION
G. Lucovsky and J. Narayan (ORNL) May 1984 16 p refs Presented at the Mater. for Future Energy Sys. Conf., 1 May 1984, Washington, D.C.
(Contracts DE-AC05-84OR-21400; N00014-79-C-0133)
(DE85-001873; CONF-840570-14) Avail: NTIS HC A02/MF A01

Amorphous thin film semiconductors for use in photovoltaic energy conversion devices, and the recrystallization of ion-implanted (amorphous) layers on crystalline semiconductors are considered. Relationships between the chemical nature of alloy elements in a Si hosts and their local chemical bonding are examined as well as focuses on recrystallization of ion-damaged the elimination of defects by recrystallizing ion-damaged layers. The activation of electronic dopants. The use of laser annealing

techniques involving rapid crystallization for the fabrication of semiconductor devices, such as solar cells is explored. DOE

N85-18802# Oak Ridge National Lab., Tenn.
REACTIVITY OF ION IMPLANTED SILICON CARBIDE
C. J. McHargue, M. B. Lewis, J. M. Williams, and B. R. Appleton 1984 17 p refs Presented at the Intern. Conf. on Surface Modification of Metals by Ion Beams, Heidelberg, 17 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001543; CONF-8409130-4) Avail: NTIS HC A02/MF A01

The implantation of chromium into single crystalline or polycrystalline (alpha—SiC produces a surface amorphous layer for displacement damage greater than 0.2 dpa at room temperature. The enhanced chemical reactivity of such specimens was studied by two methods. The chemical etching rates in a saturated solution of 50% K3Fe(CN)6-50% KOH were measured. The etching rate for the amorphous layer was 2.4 to 3.7 times that of the crystalline material for polycrystalline samples and 3.0 to 4.1 times as great for single crystal samples. Polycrystalline specimens were exposed to flowing O2 for 1 h at 1300(O2)C. Rutherford backscattering and the nuclear reaction (d,p) determined the amount of O2 on the surface. The amount of O2 (and thickness of oxide) over the amorphous region was 1.67 times that over the crystalline region. The relative thickness of the oxide on the amorphous and crystalline regions was confirmed by measuring the sputtering time required to remove the O2 signal in an Auger spectrometer. DOE

N85-18803# Oak Ridge National Lab., Tenn. Solid State Div.
OPTICALLY INDUCED INTERVALENCE-BAND TRANSITIONS IN GERMANIUM BY THE ABSORPTION OF 1.06 MICROMETERS PICOSECOND PULSES
R. B. James Jan. 1984 12 p refs Presented at the 6th Intern. Conf. on Lasers and Applications, San Francisco, 12-16 Dec. 1983
(Contracts DE-AC05-84OR-21400; W-7405-ENG-26)
(DE85-000946; CONF-831265-5) Avail: NTIS HC A02/MF A01

The intervalence band absorption coefficient in germanium is calculated as a function of the hole density and temperature for light with a wavelength of 1.06 micron. This absorption mechanism is normally negligible compared to the interband absorption; however, for a sufficiently dense electron-hole plasma, the free-hole intervalence band absorption can become comparable to the interband absorption. Furthermore, the interaction of intense 1.06 micron m light can alter the distribution of resonantly-coupled hole states and lead to an intensity dependence in the intervalence band absorption cross section. For a fixed hole density, the intervalence band cross sections due to free-hole transitions between the heavy- and split-off hole bands and between the light- and split-off hole bands are found to decrease with increasing intensity in a manner closely approximated by an inhomogeneously broadened two-level model. Values for the saturation intensity of each resonant transition are calculated as a function of the hole density and temperature. DOE

N85-18804# Argonne National Lab., Ill.
FUNDAMENTAL ASPECTS ON ION-BEAM SURFACE MODIFICATION: DEFECT PRODUCTION AND MIGRATION PROCESSES
L. E. Behn, R. S. Averback, and P. R. Okamoto Sep. 1984 31 p refs Presented at Intern. Conf. on Surface Modification of Metals by Ion Beams, Heidelberg, F.R. Germany, 17 Sep. 1984
(Contract W-31-109-eng-38)
(DE85--00093; CONF-8409130-5) Avail: NTIS HC A03/MF A01

In addition to the implanted species, several defect production and migration mechanisms contribute to changes in the near-surface composition of an alloy during ion bombardment, e.g., atoms exchange positions via displacements and replacement sequences; preferential sputtering effects arise; radiation-enhanced diffusion and radiation-induced segregation occur. The latter two defect migration mechanisms can alter the composition to depths which are much greater than the implanted ion range. By altering various parameters such as irradiation temperature, ion mass, energy, and current density, and initial alloying distributions, a rich variety of near-surface composition profiles can be created. Changes in ion mass and energy, and irradiation temperature are used to distinguish defect production from defect migration effects. Experimental results are presented which provide a guide to the relative efficiencies of different mechanisms under various irradiation conditions. DOE

N85-18805# Argonne National Lab., Ill.
COMPUTER SIMULATION OF MULTIPLE STABILITY REGIONS IN AN INTERNALLY COOLED SUPERCONDUCTING CONDUCTOR AND OF HELIUM REPLENISHMENT IN A BATH-COOLED CONDUCTOR
L. R. Turner and J. Shindler Sep. 1984 5 p refs Presented at Applied Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract W-31-109-eng-38)
(DE85-002112; CONF-840937-6) Avail: NTIS HC A02/MF A01

For upcoming fusion experiments and future fusion reactors, superconducting magnets were chosen or considered which employ cooling by pool-boiling He1, by He2, and by internally flowing He1. The choice of conductor and cooling method should be determined in part by the response of the magnet to sudden localized heat pulses of various magnitudes. The successful computer simulation of multiple stability in internally cooled conductors, as observed experimentally, using the computer code SSICC is described. The modeling of helium replenishment in the cooling channels of a bath-cooled conductor, using the computer code TASS is also covered. DOE

N85-18806# Washington Univ., St. Louis, Mo. Dept. of Physics.
MICROSCOPIC DETERMINATIONS OF LATTICE AND ELECTRONIC STRUCTURES OF SOLIDS Final Report, 1 Jul. 1979 - 30 Jun. 1984
P. C. Gibbons Aug. 1984 18 p refs
(Contract DE-AC02-79ER-10440)
(DE84-017323; DOE/ER-10440/7) Avail: NTIS HC A02/MF A01

Electron energy loss data demonstrated in the range from 0.5 KeV to 3 KeV can be analyzed to obtain accurate local-structure information. Large peaks in excitation spectra are studied which have no one-particle explanation. Both of these will produce significant new understanding of many-electron effects in atoms and in solids. DOE

N85-18807# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF HYDROSTATIC PRESSURE ON TRAPPING CENTERS IN STRAINED-LAYER SUPERLATTICE STRUCTURES
C. E. Barnes, G. A. Samara, R. M. Biefeld, G. C. Osbourn, and T. E. Zipperian Aug. 1984 5 p refs Presented at the 17th Intern. Conf. on the Phys. of Semiconductors, San Francisco, 6 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE85-001362; SAND-84-0650C; CONF-840879-8) Avail: NTIS HC A02/MF A01

This paper reports initial results on the effects of hydrostatic pressure on the emission energies of two prominent deep levels in gamma-irradiated SLS's consisting of alternating layers of GaP and GaAsP grown by MOCVD. As the growth of an SLS effects the lattice constants of the individual components, the application of hydrostatic pressure to a semiconductor can also affect the lattice constant and the bulk electronic properties. This parallel suggests that the properties of the host-SLS may have an effect on the response of the trap to pressure. DOE

N85-18808# Oak Ridge National Lab., Tenn. Solid State Div.
ION BEAM PROCESSES IN SI
O. W. Holland, J. Narayan, and D. Fathy (North Carolina State Univ.) Jul. 1984 20 p refs Presented at the Ion Beam Modification of Mater. Conf., Ithaca, N.Y., 16 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001254; CONF-840760-12) Avail: NTIS HC A02/MF A01

Observation of the effects of implants of energetic ions at high dose rates into Si have produced some exciting and interesting results. The mechanism whereby displacement damage produced by ions self-anneals during high dose rate implantation is discussed. It is shown that ion beam annealing (IBA) offers in certain situations

unique possibilities for damage annealing. Annealing results of the near surface in Si with a buried oxide layer, formed by high dose implantation, are presented in order to illustrate the advantages offered by IBA. It is also shown that ion irradiation can stimulate the epitaxial recrystallization of amorphous overlayers in Si. The nonequilibrium alloying which results from such epitaxial processes is discussed as well as mechanisms which limit the solid solubility during irradiation. Finally, a dose rate dependency for the production of stable damage by ion irradiation at a constant fluence was observed. For low fluence implants, the amount of damage is substantially greater in the case of high flux rather than low flux implantation. DOE

N85-18809# Sandia Labs., Albuquerque, N. Mex.
COMPARISON OF IONIZING RADIATION AND HOT ELECTRON EFFECTS IN MOS STRUCTURES
R. E. Mikawa and P. M. Lenahan 1984 10 p refs Presented at the 21st IEEE Ann. Conf. on Nucl. and Space Radiation Effects, Colorado Springs, 22 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE84-016766; SAND-84-1187C; CONF-840712-12) Avail: NTIS HC A02/MF A01

Electron spin resonance was used to compare the effects of electron injection and gamma radiation on metal oxide semiconductor (MOS) devices. Electron injection is similar to ionizing radiation in that in both cases P (sub b) centers are generated at the Si/SiO2 interface. However, the effects are not identical. Although ionizing radiation create E' centers in the SiO2, no E' generation in oxides subjected to electron injection was observed. DOE

N85-18810# Argonne National Lab., Ill.
SINGLE CRYSTAL SILICON AS A LOW-TEMPERATURE STRUCTURAL MATERIAL
P. R. Roach Jul. 1984 5 p refs Presented at the 10th Intern. Conf. on Cryogenic Eng., Espoo, Finland, 31 Jul. 1984
(Contract W-31-109-eng-38)
(DE84-017469; CONF-840705-4) Avail: NTIS HC A02/MF A01

In neutron scattering applications, it is frequently desirable to construct a sample container from a material that is strong but has very little neutron absorption of scattering. Single crystal silicon is very good by these criteria but it is difficult to work with because of its brittleness. A technique for gluing silicon was developed that yields high strength joints at low temperatures and allows very compact designs for sample containers. DOE

N85-18811# Sandia Labs., Albuquerque, N. Mex.
ION-IMPLANTATION DOPING OF STRAINED-LAYER SUPERLATTICES
David R. Myers 1984 17 p refs Presented at the 8th Conf. on the Application of Accelerators in Research and Industry, Denton, Tex., 12 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-001903; SAND-84-1902C; CONF-841117-1) Avail: NTIS HC A02/MF A01

Strained-layer superlattices (SLS's) are a novel class of electronic materials whose bandgap and transport properties can be tailored during growth by the selection of appropriate layer thickness and chemical composition. Localized doping of III to V compound semiconductor SLS's can be achieved by masked ion implantation followed by controlled atmosphere annealing. Electrical activation of the implanted species and survival of the host superlattice can be detected by Raman spectroscopy; these conclusions are reinforced by a variety of complementary measurements. Values for dopant electrical activation and mobilities in the implantation-doped SLS's are consistent with those obtained for similar implants and anneals in the nearest binary compound semiconductors. These results reflect favorably on the stability of strained-layer superlattices and allow exploitation of the unique properties of strained-layer superlattices in novel electronic devices. Author

N85-18812# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany). Dept. of Data Processing and Electronics.
THE Si/SiO2 INTRINSIC STATES AND INTERFACE CHARGES. CHAPTER 1: ORIGIN, PROPERTIES, MODELS, IMPACT
W. R. Fahrner, E. Klausmann (Fraunhofer-Inst. Angewandte Festkoerperphysik), and D. Braeunig Jun. 1984 166 p refs
(HMI-B-413) Avail: NTIS HC A08/MF A01

The SiO2/Si interface states, Dit, and oxide fixed charges, Qf, and their dynamics are surveyed. Their inclusion in equivalent networks is outlined. The impact of specific technological steps on the number of interface and fixed oxide charges is considered. Models for Dit and Qf are discussed. It is shown how they degrade the performance of silicon devices. Author (ESA)

N85-18660# Joint Publications Research Service, Arlington, Va.
SEMICONDUCTORS AT LEIPZIG SPRING FAIR
A. Blodszun and W. E. Schlegel *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-005) 4 Feb. 1985 p 1-13 Transl. into ENGLISH from Radio Fernsehen Elektron. (East Berlin), v. 33, no. 6, Jun. 1984 p 344-348 (For primary document see N85-18659 09-70)
Avail: NTIS HC A04/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-18813 Oregon Univ., Eugene.
ISOLATED SYSTEMS IN GENERAL RELATIVITY Ph.D. Thesis
Alan Cresswell 1984 134 p
Avail: Univ. Microfilms Order No. DA8424010

Isolated systems in General Relativity were studied. Radiation effects on composite isolated systems are examined. The nonlinear asymptotic vacuum field equations were solved in the formalism of Newman and Penrose. A Spin Weight Spherical Harmonics representation of the source was used. The concept of angular momentum is examined for isolated systems in General Relativity. It is argued that, on physical grounds, the definition of angular momentum in General Relativity should stem from the expression linear momentum in a way similar to the expression L = rxP used for theories in pseudo-Euclidian spaces. Starting from the most commonly accepted definitions of energy-momentum, it is found that the Landau and Lifshitz quantity which is the only one derived from a symmetric energy momentum expression is also the only one to reduce to the angular momentum of the non-radiative exact Kerr solution. This result is strikingly different from what is usually proposed in the literature. Dissert. Abstr.

N85-18814# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
AVAILABLE ENERGY METHOD FOR EVALUATING THERMODYNAMIC PERFORMANCE OF HEAT PUMP SYSTEMS
C. J. Bliem, O. J. Demuth, and S. L. Richlen 30 Mar. 1984 21 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AC07-76ID-01570)
(DE84-017223; EGG-M-09784; CONF-840804-49) Avail: NTIS HC A02/MF A01

An available-energy-efficiency method, based on the second Law of Thermodynamics, is developed for the evaluation and comparison of the thermodynamic performance of different types of heat pump systems. Deficiencies and limitations of the more commonly used performance indicators, coefficient of performance and fraction of Carnot cycle coefficient of performance, are discussed. Finally, several heat pumps of different types are evaluated and compared in terms of available-energy efficiency as examples of the application of the method. DOE

N85-18815# Los Alamos Scientific Lab., N. Mex.
REDUCTION OF THE WAVEPACKET: HOW LONG DOES IT TAKE?
W. H. Zurek 1984 6 p refs Presented at NATO Advanced Study Inst. on Nonequilibrium Quantum Statistical Mechanics, Santa Fe, N. Mex., 3 Jun. 1984
(Contract W-7405-eng-36)
(DE84-016778; LA-UR-84-2750; CONF-8406194-2) Avail: NTIS HC A02/MF A01

The reduction of the wavepacket caused by the interaction with the environment occurs on a timescale which is typically many orders of magnitude shorter than the relaxation timescale tau. In particular, it is shown that in a system interacting with a canonical heat bath of harmonic oscillators, decorrelation timescale of two pieces of the wavepacket separated by N thermal de Broglie wavelengths in approximately tau/N(2). Therefore, in the classical limit h bar (YIELDS) O dynamical reversibility (tau - YIELDS infinity) is compatible with instantaneous coherence loss. DOE

N85-18816# Brookhaven National Lab., Upton, N. Y.
THIN END OF THE WEDGE
Probir Roy (Tata Inst. of Fundamental Research, Bombay) 1984 14 p refs Presented at the Theoretical Workshop on Electroweak Symmetry Breaking at the Superconducting Super Collider, Berkeley, Calif., 4-22 Jun. 1984
(Contract DE-AC02-76CH-00016)
(DE84-016439; BNL-35082; CONF-8406190-1) Avail: NTIS HC A02/MF A01

A top mass in the range 20 to 55 GeV imposes tight bounds on the light Higgs masses in the minimal SUSY-extended electroweak theory with soft SUSY-breaking and radiative EW-breaking induced at the same scale by an underlying N=1 SUGRA GUT. In particular, the lightest Higgs must weigh quite a bit less than M/sub Z//2, being therefore detectable at SLC and LEP. This will be a test for such theories. DOE

N85-18817# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
HYDRODYNAMIC FLOW STRUCTURES IN QUANTUM FIELD THEORY
P. Carruthers and F. Zachariasen (Calif. Inst. of Technol., Pasadena) May 1984 8 p refs Presented at the Conf. on the Intersections Between Particle and Nucl. Phys., Steamboat Springs, Colo., 23-30 May 1984
(Contract W-7405-ENG-36)
(DE84-015513; LA-UR-84-2278; CONF-8405193) Avail: NTIS HC A02/MF A01

The transport of matter is examined in the context of relativistic quantum transport theory for the case of neutral scalar fields. The goal is to formulate a theory valid off mass shell and out of equilibrium. A conserved moment tensor was constructed which coincides with the ensemble average of the Noether tensor, or the improved energy-momentum tensor within an additive constant of the improvement term. Conditions for closure of the conservation equation are given for the phi(4) coupling. DOE

N85-18818# Fondazione Ugo Bordoni, Rome (Italy).
ASYMMETRICAL HARMONIC OSCILLATOR AND FINE-STRUCTURE CONSTANT
Bruno Crosignani and Paolo DiPorto (Aquila Univ.) Jun. 1984 13 p refs
(FUB-9-1984) Avail: NTIS HC A02/MF A01

The energy eigenvalues of the quantum asymmetrical harmonic oscillator were avaluated to determine two characteristic adimensional quantitites, which can be combined in a simple way to yield a numerical value close to that of the fine-structure constant. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-18819# Navy Personnel Research and Development Center, San Diego, Calif.
BIBLIOGRAPHY OF UNCLASSIFIED REPORTS, FY 1984 Technical Report, Oct. 1983 - Sep. 1984
Nov. 1984 41 p
(AD-A148838; NPRDC-TR-85-8) Avail: NTIS HC A03/MF A01 CSCL 05/1

This report lists all unclassified technical reports, special reports, and technical notes that have been published by the Center in FY 1984. Manpower and Personnel Laboratory technical notes and Training Laboratory reports published in FY 1984 are also listed. Publications in each category are listed in chronological order under six areas: manpower management, personnel administration, organization management, education and training, human performance, and bibliographies, reviews, and summaries. GRA

N85-18820# Sandia Labs., Albuquerque, N. Mex.
GIDEP REPRESENTATIVE INTERACTION
B. K. Jojola 1984 8 p refs Presented at GIDEP Ann. Workshop, Spokane, 2 Oct. 1984
(DE84-016792; SAND-84-1339C; CONF-8410141-1) Avail: NTIS HC A02/MF A01

The Government-Industry Data Exchange Program (GIDEP) representatives interact within their own company to provide data and information to employees and GIDEP activity reports to management. Through this interaction, the objectives of GIDEP are served and the benefits of other companies and government agencies can further expand the usefulness of GIDEP and reduce operating costs. One way to reduce costs is the exchange of hard copy or microfiche reports between GIDEP representatives rather than copying reports from GIDEP microfilm. Interaction between representatives can expand each company's information resources and range of available data. The GIDEP representatives acquainted with information available from other representatives are more useful to their companies and to GIDEP users. DOE

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-18821 Rutgers - The State Univ., New Brunswick, N. J.
METHODOLOGY FOR EVALUATING RELATED DATABASES AND A COMPUTERIZED ALGORITHM FOR MERGING THEIR OUTPUT Ph.D. Thesis
Leny Struminger 1984 128 p
Avail: Univ. Microfilms Order No. DA8424163

Two related bibliographic databases in the field of medicine (Excerpta Medica and Medline) were analyzed for file content and record content and observations gathered on the treatment of journal articles in each of the databases. A sample of 331 articles

indexed by both databases from 22 randomly selected journals in the field were used in order to study the consistency in the representation of the original documents. From the patterns observed in the treatment of titles, authors, abstracts, volume, issue and pagination by year of publication and by journal, recommendations are made for record standardization. The pagination field was found to be consistently correct and in agreement in 99% of the cases studied and the author field after editing was also found to be in agreement in 97% of the cases. Based on these findings a programmable computer algorithm was developed to identify duplicate citations among related databases. The resulting programs can be stored in microcomputers and used to edit the output from cross-database searching to provide a more practical bibliography. Dissert. Abstr.

N85-18822 Case Western Reserve Univ., Cleveland, Ohio.
ONLINE DATABASE SEARCH STRATEGIES AND THESAURAL RELATIONSHIP MODELS Ph.D. Thesis
Alice Yanosko Chamis 1984 310 p
Avail: Univ. Microfilms Order No. DA8425965

Thesaural relationship models were investigated to measure the degree of compatibility and switching capability among different indexing vocabularies. A compatibility and switching value was determined for each vocabulary which can be used to select the appropriate vocabulary or corresponding online database for searching. Search strategies based on the thesaural relationship model were formulated for a variety of questions and tested using the NASA/RECON database. Evaluation of this switching online search strategy and comparison with a control group shows that the effectiveness decreased. However, this strategy is useful when a high precision search is wanted by an inexperienced searcher, unfamiliar with the search vocabulary of a specific database. An additional search strategy was formulated based on the frequency of occurrence of index terms. Test and evaluation of this frequency online search strategy revealed an increase in effectiveness. This strategy is useful for both the experienced and inexperienced user when a high recall search is important. Recommendations for future research are summarized. Dissert. Abstr.

N85-18823# Bendix Corp., Kansas City, Mo.
INTEGRATING HETEROGENEOUS NON-GEOMETRIC INFORMATION SYSTEMS USING RIM
M. L. Smith Aug. 1984 47 p refs
(Contract DE-AC04-76DP-00613)
(DE84-017600; BDX-613-3073) Avail: NTIS HC A03/MF A01

The Kansas City Division of the Bendix Corporation is addressing the task of achieving cost effectiveness information flow and logical integration within a diverse set of manufacturing information systems. The Relational Information Model (RIM) is tested as one component in a three schema architecture for nongeometric data models. In this experiment, the enterprise or conceptual schema is captured and maintained in a vendor supported semantic information modeler. A RIM schema can be generated automatically from the information model. This allows transporting portions of the enterprise or conceptual schema to each information system. Results of tests on integration and data exchange performed to date will be reported. DOE

N85-18824# California Univ., Livermore. Lawrence Livermore Lab.
ONLINE DIRECTORY OF DATABASES FOR MATERIAL PROPERTIES
V. E. Hampel, W. A. Bollinger, C. A. Gaynor, and J. J. Oldani May 1984 124 p refs Presented at the 9th Intern. CODATA Conf., Jerusalem, 24 Jun. 1984
(Contract W-7405-eng-48)
(DE84-016511; UCRL-90276-Rev-1; CONF-8406139-1-Rev-1) Avail: NTIS HC A06/MF A01

A directory which is intended to provide interactive access to scientific and technical data bases available to the public that contain information pertaining to nuclear atomic, molecular, physical, chemical, and mechanical properties of substances is presented. In addition to the 101 data files previously reported, the information was updated and more than 38 new numeric databases and predictive systems in these fields were identified. The contents of the databases are described, information on the availability of the databases and their online access over public telephone and data networks are updated. This directory is expected to become particularly important to the national and international magnetic and laser-energy fusion projects, nuclear criticality safety, and computer aided engineering programs. E.A.K.

N85-18825# Oak Ridge National Lab., Tenn. Engineering Physics and Mathematics Div.
THE ESTABLISHMENT AND EXPERIENCE OF THE CARBON DIOXIDE INFORMATION CENTER (CDIC) Progress Report, Jan. 1982 - Sep. 1983
Betty F. Maskewitz, Julia A. Watts, Charles R. Weisbin, Linda J. Allison, Betty F. Jacobs, and Helen A. Pfuderer Oct. 1984 88 p
(Contract DE-AC05-84OR-21400)
(DE85-001934; ORNL/TM-9350) Avail: NTIS HC A05/MF A01

The Carbon Dioxide Research Division (CDRD) of the Department of Energy's (DOE) Office of Basic Energy Sciences established a Carbon dioxide Information Center (CDIC) at the Oak Ridge National Laboratory (ORNL) in January 1982 to support the nation's carbon dioxide-climate research effort by providing a focal point for the compilation and distribution of CO2-related information under systematic quality control. This informal report documents the establishment and experience of the center during the period January 1, 1982 to September 30, 1983. Progress on the activities and accomplishments by the center are discussed using specific examples to illustrate the concept and development of a specialized information analysis center. DOE

N85-18826# California Univ., Livermore. Lawrence Livermore Lab.
DOCUMENTATION FOR AN INSTRUMENT DATABASE SYSTEM
Richard Crawford, Hal Rand, Carla Wong, Hugh Gregg (Michigan State Univ.), Phil Hoffman (Michigan State Univ.), and Chris Enke (Michigan State Univ.) Sep. 1984 15 p
(Contract W-7405-eng-48)
(DE84-017392; UCID-20170) Avail: NTIS HC A02/MF A01

An Instrument Database System software package made up of a series of FORTRAN subroutines and programs is described. The database is particularly suited to multi-dimensional data such as that created by a triple quadrupole mass spectrometer. These subroutines and programs should compile and run on any DEC PDP-11 series computer using the RT-11 or RSX-11M operating system. The documentation of the software is broken down into six categories: (1) subroutines to store data in the database; (2) subroutines to read data from the database; (3) programs to print raw or averaged data from the database; (4) programs to extract selected parameters from the database in order to plot them; (5) plotting routines; and (6) utility routines to prepare dictionaries and to modify plot files. Additional documentation can be found within the listings of the programs, the subroutines, or the files having suffixes of -DOC, -TXT or -RNO. DOE

N85-18827# Fondazione Ugo Bordoni, Rome (Italy).
AUTOMATION OF INFORMATION SERVICES FURNISHED BY DOCUMENTATION CENTERS AND SPECIALIZED LIBRARIES [AUTOMAZIONE DEI SERVIZI DI INFORMAZIONE FORNITA DA CENTRI DI DOCUMENTAZIONE E DA BIBLIOTECHE SPECIALI]
Claudia Rosa May 1984 12 p refs In ITALIAN
(FUB-6-1984) Avail: NTIS HC A02/MF A01

The structure and organization of information centers is discussed. The analysis includes bibliographic information research, information retrieval, physical documents recovery, technical support management and bibliographic data bases.
Author (ESA)

N85-18828# Agricultural Research Service, Beltsville, Md.
RETRIEVAL PROCEDURES FOR HYDROLOGIC DATA FROM ARS (AGRICULTURAL RESEARCH SERVICE) EXPERIMENTAL

WATERSHEDS IN THE US (REPHLEX)
J. L. Thurman, R. T. Roberts, and J. B. Burford Aug. 1984 123 p
(PB85-111326/GAR; ARS-2) Avail: NTIS HC A06/MF A01 CSCL 08H

The scope and use of Retrieval Procedures for Hydrologic Data from Agricultural Research Service (ARS) Experimental Watersheds (REPHLEX) are described. The REPHLEX system consists of several interactive computer procedures developed to gain access to the ARS Water Data Bank. The data stored in the bank were collected by various groups and individuals within and without ARS for specific research projects that are in progress or have been completed. This publication is intended to serve as a training manual and reference guide to retrieve, condense, and reformat precipitation and runoff files stored in the ARS Water Data Bank. GRA

N85-17973# General Dynamics Corp., St. Louis, Mo.
THE GENERATION OF THREE-DIMENSIONAL DATA BASES USING A BUILDING BLOCK APPROACH
D. D. Smart, R. D. Teichgraeber, and A. C. Chirieleison *In* AF Human Resources Lab. The IMAGE 3 Conf. Proc. Sep. 1984 p 165-176 (For primary document see N85-17962 09-01)
(AD-P004319) Avail: NTIS HC A22/MF A01 CSCL 01/2

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N85-18829# Committee on Commerce, Science, and Transportation (U. S. Senate).
SUNSET OF THE CIVIL AERONAUTICS BOARD
Washington GPO 1984 80 p Hearing before the Subcomm. on Aviation of the Comm. on Com., Sci. and Transportation, 98th Congr., 2d Sess., 21 Jun. 1984
(S-Hrg-98-940; GPO-36-715) Avail: Subcommittee on Aviation

The question of what Government agency should receive airline consumer affairs authority when the Civil Aeronautics Board sunsets is considered. A.R.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-18830*# Ecosystems International, Inc., Crofton, Md.
RAILROAD SAFETY PROGRAM, VOLUME 1 Final Report
Jan. 1985 257 p refs
(Contract NASw-3789)
(NASA-CR-174333; NAS 1.26:174333) Avail: NTIS HC A12/MF A01 CSCL 13F

Since 1981, the Federal Railroad Administration (FRA) has annually prepared a National Inspection Plan (NIP) whose purpose is to summarize regional efforts to improve railroad transportation safety. The research concluded on the following tasks including the problems, conclusions and recommendations associated with these tasks is summarized: (1) the preparation of the 1983 NIP, with recommended procedures for improving future NIPs; (2) the development of an outline for the 1984 NIP, including a methodology for the allocation of inspection resources and other specialized regional activities; (3) the management and development of the 1984 NIP; and (4) the development of an instruction manual to be used in the preparation of future NIPs. R.S.F.

N85-18831*# Garrett Turbine Engine Co., Phoenix, Ariz. Engineering Staff.
ADVANCED GAS TURBINE (AGT) POWERTRAIN SYSTEM DEVELOPMENT FOR AUTOMOTIVE APPLICATIONS Semiannual Progress Report, Jul. - Dec. 1983
Jun. 1984 70 p refs
(Contract DEN3-167)
(NASA-CR-174809; DOE/NASA/0167-8; NAS 1.26:174809; Garrett-31-3725(8); SAPR-8) Avail: NTIS HC A04/MF A01 CSCL 13F

Rotor dynamic instability investigations were conducted. Forward ball bearing hydraulic mount configurations were tested with little effect. Trial assembly of S/N 002 ceramic engine was initiated. Impeller design activities were completed on the straight line element (SLE) blade definition to address near-net-shape powder metal die forging. Performance characteristics of the Baseline Test 2A impeller were closely preserved. The modified blading design has been released for tooling procurement. Developmental testing of the diffusion flame combustor (DFC) for initial use in the S/N 002 2100 F ceramic structures engine was completed. A natural gas slave preheater was designed and fabricated. Preliminary regenerator static seal rig testing showed a significant reduction in leakage and sensitivity to stack height. Ceramic screening tests were completed and two complete sets of ceramic static structures were qualified for engine testing. Efforts on rotor dynamics development to resolve subsynchronous motion were continued. A.S.B.

N85-18832*# SRI International Corp., Menlo Park, Calif.
NASA NEW TECHNOLOGY IDENTIFICATION AND EVALUATION Final Report
Ruth M. Lizak Dec. 1983 23 p ref
(Contract NASw-3444; SRI Proj. 2393)
(NASA-CR-174368; NAS 1.26:174368) Avail: NTIS HC A02/MF A01 CSCL 05B

Before disclosure in NASA Tech Briefs, reports of new technology are transmitted to the cognizant NASA Field Center Technology Utilization Office (TUO) where they are evaluated for novelty, technical validity and significance, and nonaerospace utility. If uncertainty exists regarding these criteria, the documentation may be forwarded to SRI International for evaluation before recommending publication. From November 1980 to November 1983, some 3,103 technologies were evaluated by SRI. Activities performed and progress made are summarized. A.R.H.

N85-18833# International Society for Terrain-Vehicle Systems, Hanover, N.H.
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON THE PERFORMANCE OF OFF-ROAD VEHICLES AND MACHINES, (8TH), VOLUME 1 Final Report, May - Aug. 1984
M. J. Dwyer Aug. 1984 506 p refs In ENGLISH, FRENCH and GERMAN Conf. held at Cambridge, England, 5-11 Aug. 1984 3 Vol.
(Contract DAJA45-84-M-0251; DA Proj. IT1-61102-BH-57)
(AD-A148634) Avail: NTIS HC A22/MF A01 CSCL 13/6

The three volumes consist of a collection of all significant papers presented at the 8th International Conference. Subjects include: tire-soil interaction; theoretical aspects of ride dynamics; track-soil interaction; practical aspects of ride dynamics; operation in paddy fields; operation on steep slopes; soil compaction; steering; computer modelling; vehicle component design; measurement of soil and snow properties and soil bin facilities; and vehicle design. For individual titles, see N85-18834 through N85-18858.

N85-18834# Louvain Univ. (Belgium).
MODELLING OF OFF-ROAD TYRES AND SOIL FOR IMPROVED TRACTION
P. F. J. Abeels *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 3-31 Transl. into ENGLISH of "Modelisation des Pneus Hors Routes et du Sol en vue de l'Amelioration de la Traction" In FRENCH and ENGLISH (For primary document see N85-18833 09-85)
(AD-P004258) Avail: NTIS HC A22/MF A01 CSCL 13/6

Many effects have been observed as a consequence of introducing machinery to agricultural land and forestry. Mainly these effects are due to induced compaction. Moreover, off-road development must look to more and more vehicles with different types of tires for different purposes. Thus it is important to deal with the problems of flexible tires in order to see how it may be possible to adapt their design to the unprepared soils on which they must run. The characteristics necessary for developing new concepts must include firstly the flexibility of the type identifying the properties of each of the principal parts of the tire in transmitting loads to the supporting surface. GRA

N85-18835# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
DEVELOPMENT OF A SOIL-WHEEL INTERACTION MODEL
G. Y. Baladi and B. Rohani *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 33-60 (For primary document see N85-18833 09-85)
(AD-P004259) Avail: NTIS HC A22/MF A01 CSCL 13/6

The determination of the response of a single flexible wheel traversing a yielding (or deformable) surface is essential for the analysis of the steering performance of wheeled vehicles. Specifically, the sinkage, motion resistance, drawbar pull, torque, and side forces acting on a powered flexible wheel moving on a yielding soil must be accurately determined. Due to the overwhelming complexity of this problem, previous research in this area has been directed, by and large, towards extensive experimentation and the development of empirical equations relating the various parameters of the problem. GRA

N85-18836# McGill Univ., Montreal (Quebec).
SOIL COMPLIANCE INFLUENCE ON TYRE PERFORMANCE
P. Boonsinsuk and R. N. Yong *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 61-80 (For primary document see N85-18833 09-85)
(AD-P004260) Avail: NTIS HC A22/MF A01 CSCL 13/6

It is not uncommon in off-road mobility for vehicles to operate over varying types of terrain. In situations where inorganic clay soils constitute the primary substrate material, considerable differences in soil stability and compliance characteristics can occur because of local variations in soil type, density and water content. This study takes into account the above constraints in the methodology developed for evaluation and prediction of efficient tire performance. This requirement for capability in development of efficient tire traction on soil for mobility purposes is critical if off-road operations are performed in remote regions where minimum fuel expenditure is particularly important. The developed analytical procedure utilizes the experience gained from experimental tow-bin tests which studied tire-soil interaction under varying tire and soil conditions. GRA

N85-18837# Royal Military Coll. of Science, Shrivenham (England).
THE ROLLING RESISTANCE AND SINKAGE OF TOWED DUAL WHEEL COMBINATION IN SAND
J. G. Hetherington and I. Littleton *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 81-86 (For primary document see N85-18833 09-85)
(AD-P004261) Avail: NTIS HC A22/MF A01 CSCL 13/6

The ability to predict the performance of wheeled vehicles across country is of paramount importance in both the design of military vehicles and assessing their effectiveness within a specified theatre of operation. In a previous paper by the authors a predictive formula was developed which effected the prediction of the rolling resistance and sinkage of towed wheels on sand. The advantage of the form of the equation was that, where other workers had employed the cone index gradient as a measure of sand strength for mobility studies, this prediction used only the soil bulk unit weight and the angle of friction of the soil. The predictive equation was shown to correlate well with experiments on a wide range of wheel geometries, loads and granular soils. GRA

N85-18838# Vehicles Research and Development Establishment, Ahmadnagar (India).
PERFORMANCE PREDICTION OF PNEUMATIC TYRES ON SAND
T. Paul *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 87-96 (For primary document see N85-18833 09-85)
(AD-P004262) Avail: NTIS HC A22/MF A01 CSCL 13/6

In this paper the applicability of laboratory test results on the scaled models of pneumatic tires in the dry sand test bins to predict mobility of vehicles in actual desert conditions in Western Rajasthan has been studied by a field test program. The tests conducted at two test sites 150 km apart show that the mobility equations derived by laboratory tests could to a fair degree of accuracy predict the trafficability over sand in actual field conditions of varying soil strength. Author (GRA)

N85-18839# Institute for Mechanization, Novi Sad (Yugoslavia).
EFFECTS OF SLIP ON ENERGY DISTRIBUTION BETWEEN TYRE AND SOIL
M. Ronai *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 97-107 (For primary document see N85-18833 09-85)
(AD-P004263) Avail: NTIS HC A22/MF A01 CSCL 13/6

Any calculation of the drawbar pull of an agricultural tractor moving over agricultural land requires a detailed study of power losses thereby occurring, which may, in principle, be defined as fellows: losses depending on pneumatic tires and losses in connection with the soil, including interface phenomenons occurring between tires and soil. GRA

N85-18840# Institute for Buildings, Mechanization and Electrification in Agriculture, Warsaw (Poland).
TRACTION FORCES OF DRIVE TYRE ON THE COMPACTED SOIL
J. Swiech *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 109-120 (For primary document see N85-18833 09-85)
(AD-P004264) Avail: NTIS HC A22/MF A01 CSCL 13/6

Kind of soil and its condition exerts an important influence on the size of traction forces achieved by driving systems. The kind of soil determined by its mechanical composition may be assumed as unaltered even for a long period of time. The condition of soil determined by its physical and mechanical properties is dependent on the kind of cultivation, vegetation humidity and compaction. As a result the value of traction forces depends on the temporary condition of soil. In order to find out the value of traction forces as influenced by the compaction of soil traction tests of tractor drive tire were effected at the Institute for Buildings, Mechanization and Electrification in Agriculture in Warsaw. Tests dealt with in this report were made under humidity of soil and operation parameters of the tire (vertical load and inflation pressure) kept fixed while changing the compaction of soil. GRA

N85-18841# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PREDICTION OF IN-SAND TIRE AND WHEELED VEHICLE DRAWBAR PERFORMANCE
G. W. Turnage *In* International Society for Terrain-Vehicle Systems

Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 121-150 (For primary document see N85-18833 09-85)
(AD-P004265) Avail: NTIS HC A22/MF A01 CSCL 13/6

In an appendix of the ISTVS 6th International Conference Paper, A Synopsis of Tire Design and Operational Considerations Aimed at Increasing In-Soil Tire Drawbar Performance, the author developed a procedure for defining Ge, effective sand penetration resistance gradient. Ge was devised to approximate the value of G that predominated during a given tire pass, normalized to one type of frictional soil (selected as Yuma sand). Ge subsequently served as the soil strength term in sand-tire numeric Nse, which aimed at providing a normalized description of tire drawbar performance in different types of sands. Because the range of sand types included in the development of Ge and Nse was necessarily quite limited, the author suggested in the Synopsis paper that other investigators test the universality of relations involving Nse and tire drawbar performance by using tire test results obtained in a variety of sands. GRA

N85-18842# Royal Military Coll. of Science, Shrivenham (England).
DYNAMIC SIMULATION OF TRACK LAYING VEHICLES
M. D. Bennett and P. H. G. Penny *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 153-170 (For primary document see N85-18833 09-85)
(AD-P004266) Avail: NTIS HC A22/MF A01 CSCL 13/6

A computer model to simulate the dynamic response of a track laying vehicle traversing defined terrain is described. Results used for validation tests are given together with a selection of typical applications. The model has proved to be flexible with applicability to a wide range of problems. Author (GRA)

N85-18843# Leeds Univ. (England). Dept. of Mechanical Engineering.
DESIGNING OFF-ROAD VEHICLES WITH GOOD RIDE BEHAVIOUR
D. N. L. Horton and D. A. Crolla *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 171-1894 (For primary document see N85-18833 09-85)
(AD-P004267) Avail: NTIS HC A22/MF A01 CSCL 13/6

The results from simple ride vibration models of off-road vehicles are examined in terms of natural frequencies, mode shapes, frequency response and response to realistic ground inputs. Despite the limitations of such models inherent in the assumptions, it is concluded that they provide designers with useful information about the dominant features of vehicle ride response. Author (GRA)

N85-18844# Technische Hochschule, Aachen (West Germany). Inst. fuer Kraftfahrwesen.
A THEORETICAL INVESTIGATION OF AN ACTIVE SUSPENSION SYSTEM FOR WHEELED TRACTORS
H. Junker and A. Seewald *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 185-214 Transl. into ENGLISH of "Theoretische Untersuchung Einer Aktiv-Federung fuer Rad-Schlepper" In GERMAN and ENGLISH (For primary document see N85-18833 09-85)
(AD-P004268) Avail: NTIS HC A22/MF A01 CSCL 13/6

Wheeled tractors, because of their operating conditions on uneven field tracks and in unconsolidated terrain, are, as a rule, subjected to strong vertical vibrations. Since, in addition, a separate suspension system for the tractor is deliberately rejected because of a conflict of aims with the correct fulfillment of important work tasks, the driver is liable to high vibration loads which, in extreme cases, can lead to reduced performance and even damage to health. GRA

N85-18845# Technische Univ., Berlin (West Germany).
INCREASE IN PERFORMANCE AND IMPROVEMENT OF RIDE COMFORT OF SELF-PROPELLED CONSTRUCTION MACHINERY BY REDUCING PITCH AND VERTICAL VIBRATION
W. Poppy and A. Ulrich *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 215-256 Transl. into ENGLISH of "Leistungssteigerung und Verbesserung des Fahrkomforts bei Selbstfahrenden Baumaschienen durch Reduzierung Einsatbedingter Nick- und Hubschwingungen" In GERMAN and ENGLISH (For primary document see N85-18833 09-85)
(AD-P004269) Avail: NTIS HC A22/MF A01 CSCL 13/6

Self-propelled unsprung construction machines - such as tractor-loaders and mobile cranes - are prone to pronounced pitching motion on uneven driving surfaces even at low forward speeds. Because of the dynamic loads which thus occur, the driver, machine and the driving surface are highly stressed and in unfavorable conditions are considerably endangered. GRA

N85-18846# Okayama Univ. (Japan).
STRESSES IN SITU GENERATING BY BULLDOZERS
H. Fujii, T. Sawada, and T. Watanabe *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 259-276 (For primary document see N85-18833 09-85)
(AD-P004270) Avail: NTIS HC A22/MF A01 CSCL 13/6

The author carried out full-scale field tests and measured stresses in situ generating by bulldozers. These data were analyzed experimentally as well as theoretically by making numerical models. Five bulldozers are used on different types of soil such as cohesive soil, sandy soil and rockfill materials. Most measured stresses are much larger than the stresses calculated from nominal contact pressure. The stress variation by traveling a bulldozer on the ground, that is the time-stress (tau-delta) relation or curve on the oscillograph shows particular shapes as if it were random vibration. GRA

N85-18847# Grumman Aerospace Corp., Bethpage, N.Y.
FINITE ELEMENT ANALYSIS OF GROUND DEFORMATION BENEATH MOVING TRACK LOADS
L. L. Karafiath *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 277-290 (For primary document see N85-18833 09-85)
(AD-P004271) Avail: NTIS HC A22/MF A01 CSCL 13/6

The major portion of the motion resistance forces encountered by vehicles traveling off-road is caused by the deformation of the ground under the vehicle load. Tracks were originally conceived as implements to distribute the vehicle load over a large area and thereby reduce the pressure to, and deformation of the ground. Tracked vehicles with rigid suspension systems distribute ground pressures nearly evenly and can, at low speed, traverse soft terrain not negotiable by other vehicles. GRA

N85-18848# Military Vehicles and Engineering Establishment, Chertsey (England).
A RIG FOR TESTING THE SOFT SOIL PERFORMANCE OF TRACK SYSTEMS
E. B. Maclaurin *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 291-311 (For primary document see N85-18833 09-85)
(AD-P004272) Avail: NTIS HC A22/MF A01 CSCL 13/6

For a given level of performance the track and suspension system of a military tracked vehicle must be as light and compact as possible to maximize weight and volume available for crew and payload (armour protection, weapon and communication systems, ammunition, fuel, etc). Although track systems have been used on military vehicles for some seventy years, methods for predicting their performance in soft soil and actual performance measurements - are limited and, even with their shortcomings, the nominal ground pressure term remains the performance comparator most commonly used by vehicle designers. This is partly because of the complexity of devising, proving and using

improved methods and partly because military vehicle testing and training areas tend to be on sandy frictional soils where tracked vehicles rarely exhibit mobility problems. GRA

N85-18849# Warsaw Technical Univ. (Poland).
THE DEPENDENCE OF SOIL BEARING CAPACITY AND DRAWBAR PULL ON THE SPACING BETWEEN TRACK BAD CAPS LANGUAGE[plates[hy]
A. Mierzwicki *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 313-328 Transl. into ENGLISH of "Die Abhaengigkeit der Bodentragfaehighkeit und der Zugkraft von der Abstandgroesse der Bodenplatten" In GERMAN and ENGLISH (For primary document see N85-18833 09-85)
(AD-P004273) Avail: NTIS HC A22/MF A01 CSCL 13/6

The spacing between track plates has hitherto been defined in theoretical and experimental work in terms of the criterion of maximum shearing stresses (maximum thrust). The geometry of the spaced link track was defined in this way. Spacing equivalent to 2-3 widths of a single track plate ensures a larger overall shearing stress ph by comparison with the traditional track (without spacing). The increase in stress ph is limited by the maximum track plate pressure, which should not exceed 0.04 MPa. GRA

N85-18850# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
THE DYNAMIC INTERACTION BETWEEN TRACK AND SOIL
P. Parringer *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 329-347 (For primary document see N85-18833 09-85)
(AD-P004274) Avail: NTIS HC A22/MF A01 CSCL 13/6

The knowledge of the dynamic interaction between track and soil is important to analyze high speed vehicles with flexible track. This paper describes a possible method for the measurement of this interaction. Force- and displacement-sensors are fixed in and on the track to measure longitudinal-, transversal- and normal-load at one track-shoe, sinkage of this track-shoe and the longitudinal- and transversal slip of this track shoe. GRA

N85-18851# Warsaw Technical Univ. (Poland).
ANALYSIS OF GROUND PRESSURE DISTRIBUTION BENEATH TRACKED MODEL WITH RESPECT TO EXTERNAL LOADING
M. M. Poncyliusz *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 349-360 (For primary document see N85-18833 09-85)
(AD-P004275) Avail: NTIS HC A22/MF A01 CSCL 13/6

This paper is a continuation of the investigation, results of which were presented at the last Conference ISTVS in Calgary in 1981. The paper was entitled, Traction Investigation of a Tracked Vehicle Model. The results obtained permitted certain conclusions to be drawn. However, the necessity of rearrangement concerned with the test model and the frame of conducted investigation appeared simultaneously. GRA

N85-18852# Carleton Univ., Ottawa (Ontario).
A COMPARISON BETWEEN A CONVENTIONAL METHOD AND AN IMPROVED METHOD FOR PREDICTING TRACKED VEHICLE PERFORMANCE
J. Y. Wong and J. Preston-Thomas *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 361-380 (For primary document see N85-18833 09-85)
(AD-P004276) Avail: NTIS HC A22/MF A01 CSCL 13/6

One of the most widely used conventional methods for predicting tracked vehicle performance is based on the assumption that the track in contact with the terrain is equivalent to a rigid footing. Furthermore, a uniform normal pressure distribution over the entire contact area is assumed if the center of gravity of the vehicle is located at the midpoint of the contact length. On the other hand, if the center of gravity is located in front of or behind the midpoint of the contact length or if load transfer due to drawbar pull takes place, a sinkage distribution of trapezoidal shape will then be assumed. Based on these assumptions and the measured pressure-sinkage and shear stress-displacement relationships of the terrain, the tractive performance of tracked vehicles is predicted. GRA

N85-18853# McGill Univ., Montreal (Quebec). Geotechnical Research Centre.
EFFECT OF HITCH POSITIONS ON THE PERFORMANCE OF TRACK-GROUSER SYSTEMS
R. N. Yong, H. Elmamlouk, and N. Skiadas *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 381-397 (For primary document see N85-18833 09-85)
(AD-P004277) Avail: NTIS HC A22/MF A01 CSCL 13/6

A number of previous research studies have been performed with the objective of developing a model to predict the performance and efficiency of tracks on ground terrain. For proper modelling, several approaches documented in the literature have been used on: (1) Strip footing idealization of the track contact area with elastic stress distribution in the soil; (2) Energy dissipation within the failed soil mass; and (3) Energy conservation considerations for the track/grouser-soil system. GRA

N85-18854# North Vehicle Research Inst., Beijing (China).
GROUSER EFFECT STUDIES
K. J. Zhang *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 399-410 (For primary document see N85-18833 09-85)
(AD-P004278) Avail: NTIS HC A22/MF A01 CSCL 13/6

After having finished the nonlinear finite element analysis of the sands under the tracked vehicle by a nonlinear finite element analysis program called NFAP, a modified Duncan model based on soil triaxial testing was suggested. The results of the experiment and the values predicted are well coincidence. The studies show that the grouser has important effect for the thrust on sands.
Author (GRA)

N85-18855# Austrian Federal Army, Vienna.
RIDE COMFORT OF OFF-ROAD VEHICLES
G. H. Hohl *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 413-432 (For primary document see N85-18833 09-85)
(AD-P004279) Avail: NTIS HC A22/MF A01 CSCL 13/6

Because of the roughness of the terrain they encounter, cross country vehicles experience more shock and vibration than ordinary road vehicles. Hence off-road speed is usually limited by the ability of the operator to withstand these vibrations to negotiate and to retain adequate control of the vehicle. In addition to other factors, the comfort of the operator, which contributes to his general safety, also depends on the physical characteristics of the seat, which is the link between the driver and the vehicle. GRA

N85-18856# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
FURTHER DEVELOPMENT IN RIDE QUALITY ASSESSMENT
N. R. Murphy, Jr. *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 433-449 (For primary document see N85-18833 09-85)
(AD-P004280) Avail: NTIS HC A22/MF A01 CSCL 13/6

Internationally, a growing concern has developed and widespread disagreement has occurred over the present methods for quantitatively describing and assessing the effects of vehicle vibrations on humans, and over the short- and the long-term effects of vibrations on drivers and occupants of heavy trucks, agricultural and earthmoving equipment, and military vehicles. None of the present methods is completely satisfactory; in fact, most criteria were developed for low-level boulevard rides and are highly suspect when applied to the several vibrational levels conducted in earthmoving and military-type operations. GRA

N85-18857# Battelle Inst., Frankfurt am Main (West Germany).
COMPARISON OF MEASURED AND SIMULATED RIDE COMFORT FOR AN AGRICULTURAL TRACTOR AND INFLUENCE OF TRAVEL SPEED AND TYRE-INFLATION PRESSURE ON DYNAMIC RESPONSE
C. Strauss and W. Christ *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 451-471 (For primary document see N85-18833 09-85)
(AD-P004281) Avail: NTIS HC A22/MF A01 CSCL 13/6

Off-road vehicles, wheeled or tracked, such as commercial vehicles (e.g., agricultural wheeled tractors, scrapers, excavating machines, trucks, truck tractors) or military vehicles (e.g., trucks, armoured vehicles and special-purpose vehicles) have to operate under extreme terrain conditions. One aspect of these conditions is the terrain roughness, which has an important influence, on the one hand on the vehicle stress, on the cargo or attached implements, and on the other hand on the ride comfort for the driver. Therefore, the need for reducing the shock and vibration levels, taking into account increasing travel speed, becomes an important criterion for the design of most of the above vehicles. GRA

N85-18858# Hokkaido Univ., Sapporo (Japan).
CHARACTERISTICS OF FARM FIELD PROFILES AS SOURCES OF TRACTOR VIBRATION
K. Ohmiya and K. Matsui *In* International Society for Terrain-Vehicle Systems Proc. of the Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 1 Aug. 1984 p 473-491 (For primary document see N85-18833 09-85)
(AD-P004282) Avail: NTIS HC A22/MF A01 CSCL 13/6

To evaluate farm field profiles as sources of tractor vibration, profiles of meadows and rough terrains were measured and analyzed. A slope angle measuring apparatus with a vertical gyroscope was made to measure profiles using the slope integration method. Periodic unevenness was not found in the measured profiles, therefore it may be assumed that profiles of farm fields, except plowed field with furrows, are random and non-periodic. Power spectral densities (0.1-3.5c/m) of measured profiles could be approximated by a straight line on a log-log paper. GRA

N85-18859# International Society for Terrain-Vehicle Systems, Hanover, N.H.
PROCEEDINGS OF THE 8TH INTERNATIONAL CONFERENCE ON THE PERFORMANCE OF OFF-ROAD VEHICLES AND MACHINES, VOLUME 2 Final Report, May - Aug. 1984
Michael J. Dwyer Aug. 1984 405 p Conf. held at Cambridge, England, 5-11 Aug. 1984 3 Vol.
(Contract DAJA45-84-M-0251; DA Proj. IT1-61102-BH-57)
(AD-A148635) Avail: NTIS HC A18/MF A01 CSCL 13/6

The three volumes are a collection of significant papers presented at the 8th International Conference. Subjects include: Tire-soil interaction; theoretical aspects of ride dynamics; track-soil interaction; various aspects of ride dynamics; operation in paddy fields; operation on steep slopes; soil compaction; steering; computer modelling; vehicle component design; measurement of soil and snow properties and soil bin facilities; and vehicle design. For individual titles, see N85-18860 through N85-18885.

N85-18860# Jilin Univ. of Tech., Changchun (China).
THE RESEARCH OF DRIVING WHEEL WITH MOVABLE LUGS OF THE PADDY FIELD FLOATING TRACTOR
C. Bing-Cong and C. Yu-Fan *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 495-505 (For primary document see N85-18859 09-85)
(AD-P004283) Avail: NTIS HC A18/MF A01 CSCL 13/6

This paper discussed the kinematics and dynamics of the paddy wheel with movable lugs penetrating into and coming out from soil perpendicularly. The calculation of the electric computer shows that for the requirement of a certain tractive force the wheel should have a certain sinkage so that it has the optimal tractive efficiency. The experiment on the specific test bench designed by the author shows: this type of wheel has a less rolling resistance and a higher tractive efficiency. Author (GRA)

N85-18861# Tractor Research Inst. of China, Luoyan.
AN INVESTIGATION OF THE DRIVING WHEEL THRUST OF PADDY FIELD TRACTORS
D. Zhuorong and Y. Shucheng *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 507-519 (For primary document see N85-18859 09-85)
(AD-P004284) Avail: NTIS HC A18/MF A01 CSCL 13/6

In this paper, the producing process of the driving wheel thrust of paddy field tractor is analyzed through experiments made in a soil bin. In essence, it is a process in which the wheel lugs are moved against the soil so that the soil in the neighborhood of contact surface is compressed and sheared. The methods for predicting the driving wheel thrust and the lug motion trajectory of paddy field tractor are proposed. The predicted values of the thrust are compared with those obtained through experiments. It shows that the predicted thrust agrees fairly satisfactorily with the measured results. Author (GRA)

N85-18862# Tsukuba Univ. (Japan). Inst. of Agricultural Engineering.
MOBILITY OF THE SMALL COMBINE (TRACK TYPE) ON SOFT GROUND-RELATIONSHIP BETWEEN THE POSITION OF THE CENTER OF GRAVITY AND THE MOBILITY
H. Esaki *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 521-537 (For primary document see N85-18859 09-85)
(AD-P004285) Avail: NTIS HC A18/MF A01 CSCL 13/6

In East Asia, approximately one million small-sized rice combines have been used on paddy fields. The objective of this study is to carry out fundamental investigations on the mobility of small combines associated with changes in the position of the center of gravity. The relationship between the position of the center of gravity and the performance of the combine in straight and circular drive was analyzed. Author (GRA)

N85-18863# Jiangsu Inst. of Tech., Zhenjiang (China). Dept. of Agricultural Mechanization.
THE STRESS-STRAIN-TIME GRAPH OF RHEOLOGICAL SOILS AND ITS APPLICATION
J. Z. Pan *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 539-543 (For primary document see N85-18859 09-85)
(AD-P004286) Avail: NTIS HC A18/MF A01 CSCL 08/13

The Burgers model and its modified form have generally been considered as the rheological model of clayey soils since 1950's through tests and analyses. Six samples of paddy soils from four provinces in South China have been collected and tested. The Burgers model is accepted as the general model of these clayey soils. GRA

N85-18864# Carleton Univ., Ottawa (Ontario).
BEHAVIOUR OF SOIL UNDER A LUGGED WHEEL
S. X. Wu, J. H. Hu, and J. Y. Wong *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 561-573 (For primary document see N85-18859 09-85)
(AD-P004287) Avail: NTIS HC A18/MF A01 CSCL 13/6

Wheels with a narrow rim and large lugs are widely used in Southeast Asia on tractors for paddy fields. The lugs of these wheels perform one or both of the following two functions: developing tractive effort and supporting vehicle weight. A great deal of field data on the performance of these wheels have been accumulated over the years. The mechanics of this type of wheel, however, has not yet been fully elucidated. To reach a better understanding of the physical nature of the problem, an investigation into the interaction between the lugs of the wheel and the soil was carried out. GRA

N85-18865# Kyoto Univ. (Japan).
PREDICTION ACCURACY OF THE TORQUES FOR ROTARY TILLAGE BY AN ANALOG TOOL
M. Yamazaki and T. Tanaka *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 561-573 (For primary document see N85-18859 09-85)
(AD-P004288) Avail: NTIS HC A18/MF A01 CSCL 02/3

Performances of prototype in soil-machine systems have been investigated and predicted by scale model data using similitude theory. However, a satisfactory prediction is not attained especially in common soil conditions where distortions occur, since present knowledge of soil-machine interactions is meager. The objective of this study is to investigate the usefulness or feasibility of an analog predicting torques on rotary blades which bring about a considerable high speed interaction. An analog prediction technique developed by Schafer et al. was used. GRA

N85-18866# International Society for Terrain-Vehicle Systems, Hanover, N.H.
THE ANALYSIS ON THE DYNAMIC PERFORMANCE OF A SINGLE LUG
T. L. Zhang and Y. J. Shao *In its* Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 575-591 (For primary document see N85-18859 09-85)
(AD-P004289) Avail: NTIS HC A18/MF A01 CSCL 13/6

The lug of a rigid lugged wheel for the paddy-field tractor is the basic element to interact with soil. The lug angle has significant effect on the tractive performance of a rigid lugged wheel in rice field. This paper analyses the interaction process between lug and soil. A calculating method of soil reaction on a single lug based on the equation of passive pressure in two dimensional soil failure is presented. It is shown that there is a good agreement between the measured and predicted pull and lift forces developed by a single lug within the test range. GRA

N85-18867# Agrozet-Research Inst. of Agricultural Machinery, Chodov (Czechoslovakia).
STUDY OF THE MOTION OF AGRICULTURAL VEHICLES ON STEEP GRASS-COVERED SLOPES
A. Grecenko *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 595-614 (For primary document see N85-18859 09-85)
(AD-P004290) Avail: NTIS HC A18/MF A01 CSCL 13/6

In large-scale farming plowing is generally practiced up to 15 deg of slope, the reason of this limitation being not only the safety of operation but also the decreasing layer of tilth and erosion as well. Steeper slopes are generally covered with grass which is either harvested or grazed. The experience indicates that adapted four-wheel drive tractors with conventional tires can harvest grass under favorable conditions on slopes up to 20 deg. For treatment and harvesting on slopes up to 26 deg special light-weight machines with low pressure tires are used; these are able to cross some local gradients up to 33 deg by means of adequate maneuvering. GRA

N85-18868# Scottish Inst. of Agricultural Engineering, Penicuik.
SOME STABILITY AND CONTROL PROBLEMS WITH TRAILED FARM TANKERS ON SLOPES
A. G. M. Hunter *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 615-633 (For primary document see N85-18859 09-85)
(AD-P004291) Avail: NTIS HC A18/MF A01 CSCL 13/6

Trailed farm tankers in Britain, which are generally used either for slurry spreading or crop spraying, have become very large in recent years. The fluid contents, which may be four times as heavy as the towing tractor, will move under gravity inside a partly full tanker and this introduces problems while driving on slopes, which have not been recognized previously. The fluid movement will affect both the stability of the tanker and the control of the tractor and trailer combination. Recent accidents where tankers overturned due to loss of stability, and where tractor and trailer combinations slid downhill due to loss of control led to extensive research on tankers. GRA

N85-18869# Scottish Inst. of Agricultural Engineering, Penicuik.
CONTROL OF TRACTORS ON SLOPING GROUND
H. B. Spencer and K. A. Crolla *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 635-653 (For primary document see N85-18859 09-85)
(AD-P004292) Avail: NTIS HC A18/MF A01 CSCL 13/6

Tractor and agricultural accidents on slopes fall into two categories. The most well known is a stability loss accident in which the tractor simply overturns. Much more common is the sliding control loss accident, frequently termed a runaway by farmers. The runaway description is apt because this is exactly how it appears to the driver - an uncontrolled speed build up when descending a slope. The accident occurs when the wheel-ground forces in the plane of the ground are no longer sufficient to maintain equilibrium on the slope. These accidents often lead to overturns of varying severity. Incidents have been reported of tractors traveling up to 1.5 km from the point of control loss before coming to rest. GRA

N85-18870# Stevens Inst. of Tech., Hoboken, N. J.
STABILITY INDICATORS FOR FRONT END LOADERS
G. Wray, J. Nazalewicz, and A. J. Kwitowski *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 655-671 (For primary document see N85-18859 09-85)
(AD-P004293) Avail: NTIS HC A18/MF A01 CSCL 13/6

This paper describes the development of a stability-indicating system for use in minimizing the occurrence of front-end loader (FEL) roll-overs in mining. The development proceeded in three phases: definition of FEL stability-instability characteristics; design of a 1st generation stability indicator; and design of a simplified, 2nd generation stability indicator. Goals met by the final design include confirmation of a simplified methodology for detecting machine instability; the ability to be installed on new loaders during manufacture or on older loaders on a retrofit basis; and reliable, easily interpretable operation. Author (GRA)

N85-18871# Technische Univ., Munich (West Germany).
PRESSURE TESTS IN SOIL BELOW TIRES OF AGRICULTURAL VEHICLES
I. Bolling *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 675-690 (For primary document see N85-18859 09-85)
(AD-P004294) Avail: NTIS HC A18/MF A01 CSCL 13/6

Design and measuring method of a cheap and efficient soil pressure gauge are described. Soil tank tests carried out in the laboratory demonstrate some properties of the gauge like indifference towards orientation in soil. In the soil bin the gauge measures pressures below tires rolling over and outside in the field the influence of wheel load, number of passes and vehicle speed are investigated. The results are interpreted with modified formulas of Soehne, which can be managed by a pocket calculator. Author (GRA)

N85-18872# Kyoto Univ. (Japan).
QUALITY CONTROL IN SOIL COMPACTION BY BEHAVIOURS OF EXCITER
S. Hata and K. Tateyama *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 691-705 (For primary document see N85-18859 09-85)
(AD-P004295) Avail: NTIS HC A18/MF A01 CSCL 08/13

Soil compaction is one of the most effective methods for soil stabilization and is performed in most earthworks of earth dams and road embankments, etc. However, because its quality control

depends upon tests performed at only several points in the fields to estimate such factors as the dry density, water content and C.B.R., misjudgement can occur when judging the degree of soil compaction required. GRA

N85-18873# Sveriges Lantbruksuniv., Garpenberg.
SMOOTHER TERRAIN-MACHINE
B. Marklund *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 707-723 (For primary document see N85-18859 09-85)
(AD-P004296) Avail: NTIS HC A18/MF A01 CSCL 13/6

Damages by terrain-vehicles on the ground and growing trees is a problem of increasing importance in forest operations, primarily in thinnings. These damages cause considerable loss of volume and quality yield in subsequent harvesting operations. The importance of this problem is expected to increase for several reasons. One is the continuously increasing area of thinning stands due to an uneven age distribution of Swedish forests. GRA

N85-18874# Military Technical Coll., Cairo (Egypt).
COMPACTION OF SAND USING ORDINARY OFF-ROAD VEHICLES
S. Shaaban *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 725-735 (For primary document see N85-18859 09-85)
(AD-P004297) Avail: NTIS HC A18/MF A01 CSCL 13/6

This paper examines the possibility of compacting a sandy soil using ordinary off-road vehicles instead of compactors. Laboratory tests showed that a considerable compaction of sand can be achieved if alternative cyclic stresses are applied. Such stresses can be generated if a train of two vehicles is employed for compaction: one vehicle with all wheels driven towed another vehicle having all wheels towed. Compaction was made by making consecutive passages of the train of two vehicles. GRA

N85-18875# Scottish Inst. of Agricultural Engineering, Penicuik.
A SIMPLE PREDICTION MODEL FOR SOIL COMPACTION UNDER VARIOUS WHEEL LOADS AND GEOMETRIES AS AN AID TO VEHICLE DESIGN
D. L. O. Smith *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 737-749 (For primary document see N85-18859 09-85)
(AD-P004298) Avail: NTIS HC A18/MF A01 CSCL 13/6

The simple, numerical model was developed, as an aid to vehicle design, to predict changes in the dry bulk density of a soil due to the passage of a wheel, or wheels, over the soil surface. The model uses Soehne's solutions to estimate stress increases, and empirical isotropic changes below a wheel. Accurate predictions of final dry bulk density for a layered soil require a more rigorous model and reliable data for the soil under consideration. GRA

N85-18876# Department of Agriculture, Auburn, Ala.
FLOTATION TIRES AND SUBSURFACE COMPACTION
J. H. Taylor and E. C. Burt *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 751-759 (For primary document see N85-18859 09-85)
(AD-P004299) Avail: NTIS HC A18/MF A01 CSCL 13/6

Theoretical and applied research has shown that the pressure at a point in the subsurface soil is a function of both the surface unit pressure and the extent of the area over which it is applied (total load). Thirty years ago, most of the soil compaction from vehicle traffic was in the plow layer and was removed by normal cultural practices. As equipment has increased in size and mass, machine designers have increased tire sizes to keep the soil surface unit pressure relatively constant. However, the increase in total axle loads is believed to have caused an increase in compaction at any given depth in the soil profile, resulting in significant compaction in the subsoil. GRA

N85-18877# Edinburgh Univ. (Scotland).
TRACTOR POWER SELECTION WITH COMPACTION CONSTRAINTS
B. D. Witney, E. B. Elbanna, and K. E. Oskoui *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 761-773 (For primary document see N85-18859 09-85)
(AD-P004300) Avail: NTIS HC A18/MF A01 CSCL 13/6

In the absence of a practical monitor of soil compaction, the increasing size of agricultural tractors is largely dominated by the upward trend in labor charges. The object of this study is to assess the feasibility of developing a compaction penalty index as a function of the penetration resistance of the soil and soil type. GRA

N85-18878# Wroclaw Univ. (Poland).
THE GUIDELINES TO DESIGN THE LEVER TURNING GEARS IN ARTICULATED VEHICLES
P. A. Dudzinski and H. Hawrylak *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 777-787 (For primary document see N85-18859 09-85)
(AD-P004301) Avail: NTIS HC A18/MF A01 CSCL 13/6

The landmark in machine development, particulary in loading and earth moving machines was the introduction of an articulated chassis. It considerably increased their maneuverability and turning abilities and improved other performance parameters in relation to the machines steered wheels. The idea of an articulated vehicle dates back to as early as the 19th century. Later years brought about the solutions of articulated vehicles suggested by a number of firms. For many years, however, the designers did not utilize this way of steering. The effective application of articulated machines was accelerated only by the development of drive systems, particularly of hydraulic ones. GRA

N85-18879# National Defence Academy, Yokosuka (Japan).
STUDY ON CONTROLLABILITY AND STABILITY OF HIGH SPEED TRACKED VEHICLES
F. Eiyo and M. Kitano *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 789-802 (For primary document see N85-18859 09-85)
(AD-P004302) Avail: NTIS HC A18/MF A01 CSCL 13/6

Numerous studies on mobility of tracked vehicles such as bulldozer and crawler tractors have been performed. The stationary turning motions of these vehicles have been reported recently. Most of these studies have been concerned with trafficability and traction mechanics in vehicle terrain interaction because these vehicles are used mainly in off-road motion at low speeds. However, there has not been any reported studies dealing with the controllability and stability of vehicles at high speeds. GRA

N85-18880# National Inst. of Agricultural Engineering, Silsoe (England).
FORCES ON UNDRIVEN, ANGLED WHEELS
M. McAllister *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 803-819 (For primary document see N85-18859 09-85)
(AD-P004303) Avail: NTIS HC A18/MF A01 CSCL 13/6

Rolling resistance and steering forces were measured on six tires in a variety of field conditions. The six tires covered the range of tread pattern and loads that are currently in use in agriculture on tractor front wheels, implements and trailers. Tractor rear tire sizes and driven wheels were not used for this work. A correlation was found between coefficient of rolling resistance and mobility number. GRA

N85-18881# Kyoto Univ. (Japan).
TURNING BEHAVIOUR OF ARTICULATED FRAME STEERING TRACTOR
A. Oida *In* Intern. Soc. for Terrain-Vehicle System Proc. of the

8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 821-833 (For primary document see N85-18859 09-85)
(AD-P004304) Avail: NTIS HC A18/MF A01 CSCL 13/6

An articulated frame steering tractor, of which construction was derived from that of a loader, consists of two parts. Those are a front part with a front axle and a rear part with a rear axle in the case of the wheeled tractor. When a steering handle rotates, the two parts bend with each other around a bending point by elongation and shortening of a hydraulic cylinder, of which both ends are respectively attached on each part. A bending angle reaches to about 38 degrees in right or left direction for a commercial articulated tractor. GRA

N85-18882# Hochschule der Bundeswehr, Hamburg (West Germany).
A TRACKED VEHICLE TEST PLANT FOR THE SIMULATION OF DYNAMIC OPERATION
I. C. Schmid *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 835-853 (For primary document see N85-18859 09-85)
(AD-P004305) Avail: NTIS HC A18/MF A01 CSCL 13/6

In 1982, a modern test plant was taken into operation at the University of the German Armed Forces in Hamburg, which has very good dynamic properties that make it possible to simulate not only rolling resistance, but also the inertia of vehicle mass and the turning resistance of a tracked vehicle. Herewith, the dynamic loads of real vehicle action on the road and in the terrain can be run on the test stand, true to reality, as it has not been feasible on power test stands employed so far. GRA

N85-18883# Technische Univ., Munich (West Germany).
INFLUENCE OF TIRE ON RESISTANCE AND STEERING FORCES OF TIRES
H. Schwanghart and K. Rott *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 855-888 (For primary document see N85-18859 09-85)
(AD-P004306) Avail: NTIS HC A18/MF A01 CSCL 13/6

There are numerous publications about forces on tires acting in or against travel direction, drawbar pull and rolling resistance, but only a few about lateral forces on steered tires. A test equipment, which provided a wealth of information of lateral-and travel resistance of front wheels in recent years, has been further developed for testing implement tires. This setup is mounted rigid on a tractor Unimog and provides measurements of longitudinal and lateral forces on tire at steering angles from 0 deg to 30 deg with different load up to 1,3 t. GRA

N85-18884# Tokai Univ., Hiratsuka (Japan).
BASIC STUDY ON THE TURNING RESISTANCE OF TRACK
N. Sugiyama and H. Kondo *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 889-899 (For primary document see N85-18859 09-85)
(AD-P004307) Avail: NTIS HC A18/MF A01 CSCL 13/6

In recent years, the construction equipments have been even used on the soft ground. The vehicles of crawler type, such as bulldozer, are superior in the trafficability of off the road. On the contrary, the turning resistance may be several times larger than that of straight travelling. Therefore the turning performance of tracked vehicles gives a serious problem. Formerly, the turning resistance was calculated by using the adhesion coefficient or coefficient of slip resistance between soil and under side of the track. But the turning resistance of the track should consist of the slip resistance of its bottom and the bulldozing resistance due to the passive earth pressure produced by side face of the track. GRA

N85-18885# National Defence Academy, Yokosuka (Japan).
STUDY ON STEERABILITY OF ARTICULATED TRACKED VEHICLES
K. Watanabe and M. Kitano *In* Intern. Soc. for Terrain-Vehicle System Proc. of the 8th Intern. Conf. on the Performance of Off-Road Vehicles and Machines, Vol. 2 (AD-A148635) Aug. 1984 p 901-915 (For primary document see N85-18859 09-85)
(AD-P004308) Avail: NTIS HC A18/MF A01 CSCL 13/6

In the previous paper, we have presented available equations of motion for analyzing the plane motion of the couple (non-articulated) tracked vehicles with tow-pins. In this paper, a mathematical analog for predicting the steerability of articulated tracked vehicles has been developed and computerized for numerical application. The analog contains all the basic parameters such as the vehicle characteristics and terrain factors related to steering problems of the vehicle. The accuracy of the analog in application has been verified by scale model tests and predictions proved quite satisfactory. GRA

N85-18886# General Electric Co., Schenectady, N. Y. Corporate Research and Development Dept.
HYBRID VEHICLE PROGRAM Final Report
Jun. 1984 208 p refs
(Contracts JPL-9950-912; DE-AI01-78CS-54209)
(DE85-000326; DOE/CS-54209/18) Avail: NTIS HC A10/MF A01

The activities on the Hybrid Vehicle Program are summarized. The program objectives and the vehicle specifications are reviewed. The Hybrid Vehicle was designed so that maximum use can be made of existing production components with a minimum compromise to program goals. The program status as of the February 9 to 10 hardware test review is presented, and discussions of the vehicle subsystem, the hybrid propulsion subsystem, the battery subsystem, and the test mule programs are included. Other program aspects included are quality assurance and support equipment. DOE

N85-18887# Tennessee Valley Authority, Chattanooga. Div. of Energy Demonstrations and Technology.
ELECTRIC VEHICLE BATTERY TEST PLAN AND RESULTS
T. W. Blickwedel May 1984 217 p
(Research Proj. RP1136-18)
(DE84-901972; TVA/OP/EDT-84/29) Avail: NTIS HC A10/MF A01

Methods and procedures used in testing EV batteries are described. Each individual module and vehicle battery pack is given an identification that is traceable through its history. Computer controlled battery capacity testing equipment is used. Three types of tests are performed: acceptance, in-vehicle, and static load. Records of tests are maintained on the forms illustrated and on computer generated outputs shown. DOE

88 SPACE SCIENCES (GENERAL)

N85-18888*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE GEOLOGY OF THE TERRESTRIAL PLANETS
Michael H. Carr, ed. (Geological Survey), R. Stephen Saunders, Robert G. Strom (Geological Survey), and Don E. Wilhelms (Geological Survey) Jun. 1984 322 p refs Original contains color illustrations
(NASA-SP-469; NAS 1.21:469) Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

The geologic history of the terrestrial planets is outlined in light of recent exploration and the revolution in geologic thinking. Among the topics considered are planet formation; planetary craters, basins, and general surface characteristics; tectonics; planetary atmospheres; and volcanism. For individual titles, see N85-18889 through N85-18894.

N85-18889*# Geological Survey, Washington, D.C.
ASTEROIDS, COMETS AND PLANET FORMATION **c91**
Michael H. Carr *In* JPL The Geol. of the Terrest. Planets Jun.

1984 p 5-12 (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

The nature of comets and asteroids is reviewed briefly. The formation of planets is examined. Meteorites and chondrites a meteoritic subclass, are discussed. R.S.F.

N85-18890*# Arizona Univ., Tucson.
MERCURY **c91**
Robert G. Strom *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 13-56 Original contains color illustrations (For primary document see N85-18888 09-88)
(Grant NsG-7146)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

The geology of the planet Mercury is considered herein. The surface of the planet, including craters, basins, tectonics, and evolution, is discussed. The orbit, rotation, magnetic fields, atmosphere, and structure of Mercury are also addressed. R.S.F.

N85-18891*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VENUS **c91**
R. Stephen Saunders and Michael H. Carr (Geological Survey, Washington, D.C.) *In its* The Geol. of the Terrest. Planets Jun. 1984 p 57-78 Original contains color illustrations (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

The following aspects of the planet Venus are discussed: orbit, rotation, composition, wind erosion, topography, surface roughness, gravity, and tectonics. The Venera satellites, Pioneer space probes, and Mariner space probes involved in Venusian exploration are enumerated. R.S.F.

N85-18892*# Geological Survey, Washington, D.C.
EARTH **c46**
Michael H. Carr *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 79-106 (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 08G

The following aspects of the planet Earth are discussed: plate tectonics, the interior of the planet, the formation of the Earth, and the evolution of the atmosphere and hydrosphere. The Earth's crust, mantle, and core are examined along with the bulk composition of the planet. R.S.F.

N85-18893*# Geological Survey, Washington, D.C.
MOON **c91**
Don E. Wilhelms *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 107-206 Original contains color illustrations (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

The present state and evolution of the physical features which are visible on the Moon's surface are emphasized herein. Lunar craters, their distribution and stratigraphy, and the cratering processes are addressed. Homologous material is presented for lunar basins. Terra breccias, maria, and mare basalts are discussed. Lunar geologic history is also considered. R.S.F.

N85-18894*# Geological Survey, Washington, D.C.
MARS **c91**
Michael H. Carr *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 207-264 (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

The following aspects of the planet Mars are addressed: general properties of the surface, the atmosphere and surface volatiles, craters and crater ages, volcanoes, wind erosion, and the polar regions. R.S.F.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-18895 Pennsylvania Univ., Philadelphia.
A SURVEY OF FAST X-RAY TRANSIENTS USING THE HEAO A-1 SKY SURVEY EXPERIMENT Ph.D. Thesis
Carol Winifred Ambruster 1984 281 p
Avail: Univ. Microfilms Order No. DA8422885

Data from the first complete pass of the sky by the Sky Survey experiment on the HEAO 1 X-ray satellite were systematically searched for fast X-ray transient events of less than a few hours duration. Ten fast transients were found, ranging in intensity from 8 x 10 to the -11th power to 4 x 10 to the -9th power ERGS/sq cm/s. Properties investigated include variability characteristics and timescales, presence or absence of quiescent flux, spectral hardness, identifications, yearly event rate, and the number-flux relation. Identifications are proposed for four transients, all with active coronal sources: the dMe flare stars EV Lac, AT Mic and EQ Vir, and the RS CVn binary HD 8357. Although unidentified, the properties of the brightest transient, HO547-14, could be determined in considerable detail and are sufficient to cast doubt on the identification of HO547-14 with any currently known flaring X-ray classes. The hypothesis that HO547-14 represents X-ray emission from a faint gamma-ray burst results in very good agreement with the observations. Dissert. Abstr.

N85-18896 Maryland Univ., College Park.
THE FLUORESCENCE OF COMETARY OH AND CN Ph.D. Thesis
David Glenn Schleicher 1983 205 p
Avail: Univ. Microfilms Order No. DA8421259

The fluorescent equilibrium of the molecules OH and CN in the solar radiation field was calculated as a function of heliocentric radial velocity. For OH, ultraviolet band profiles were compared with the observed, high resolution spectra of five comets. Variations of fluorescence efficiency for the 0-0 band, the 1-0 band, and the 1-1 band are explored. The infrared OH vibrational bands are predicted. The rate of photodissociation of OH was calculated as a function of heliocentric velocity, yielding a lifetime for OH (at 1 AU) ranging from 180,000s to 400,000s. The structure of the CN violet 0-0 band was recalculated for the same range of velocities using a new solar spectrum. While the fluorescence efficiency varies by approximately the same amount (2x) with velocity at distances from 0.25 to 4.00 AU, the structure of this variation changes dramatically with the distance. Results of this calculation are also used in fluorescence calculations of the violet and red vibrational bands on CN. Comparisons to cometary observations are used to help restrict the possible values for several poorly known molecular parameters of CN. Dissert. Abstr.

N85-18897 Arizona Univ., Tucson.
ASTEROID TAXONOMY FROM CLUSTER ANALYSIS OF PHOTOMETRY Ph.D. Thesis
David James Tholen 1984 162 p
Avail: Univ. Microfilms Order No. DA8421985

A principal component analysis shows that 95 percent of the information contained in the seven independent color indices for asteroids is contained in two principal components. Photometric radiometric data sets were used, along with cluster analysis techniques, to produce an improved asteroid taxonomic system. Seven major classes are now recognized and are designated A, C, D, E, M, P, and S. Three interesting minor classes are also identified: B, F, and G. Marginal evidence for an eighth major class, here called T, exists in the data, but the reality of this class awaits confirmation by further observations of potential members. Three asteroids do not fall into any of the above classes and are assigned unique designations R (349 Dembowski), Q (1862 Apollo), and V (4 Vesta). Dissert. Abstr.

N85-18898*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES. EXPLANATORY SUPPLEMENT

C. A. Beichman, ed., G. Neugebauer, ed., H. J. Habing, ed., P. E. Clegg, ed., and T. J. Chester, ed. [1985] 396 p refs Document includes microfiche supplement

(NASA-CR-174311; NAS 1.26:174311) Avail: NTIS HC E14/MF A01 CSCL 03A

The Infrared Astronomical Satellite (IRAS) mission is described. An overview of the mission, a description of the satellite and its telescope system, and a discussion of the mission design, requirements, and inflight modifications are given. Data reduction, flight tests, flux reconstruction and calibration, data processing, and the formats of the IRAS catalogs and atlases are also considered. For individual titles, see N85-18899 through N85-18908.

N85-18899*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES: INTRODUCTION

G. Neugebauer and C. A. Beichman *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 8 p (For primary document see N85-18898 09-89)

Avail: NTIS HC E14/MF A01 CSCL 03A

An overview is given of the mission of the Infrared Astronomical Satellite (IRAS). The IRAS mission is to conduct a sensitive and unbiased sky survey in four wavelength bands at 12, 25, 60, and 100 micrometers. The project was initiated in 1975 as a joint program of the United States, the Netherlands, and the United Kingdom. R.J.F.

N85-18900*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SATELLITE DESCRIPTION **c15**

F. C. Gillett, P. E. Clegg, G. Neugebauer, D. Langford, A. Pouw, W. Irace, and J. Houck *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 25 p refs (For primary document see N85-18898 09-89)

Avail: NTIS HC E14/MF A01 CSCL 22B

The onboard computers and their associated software, the attitude control system, and data recording and the communication links of the infrared astronomy satellite (TRAS) are discussed. The IRAS telescope system is considered in detail. Attention is directed towards the cryogenics, thermal control, optics, focal plane assembly, and electronics associated with the telescope system. R.S.F.

N85-18901*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE IRAS MISSION

J. P. Emerson, H. J. Habing, P. E. Clegg, and S. Lundy *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 23 p refs (For primary document see N85-18898 09-89)

Avail: NTIS HC E14/MF A01 CSCL 03A

The infrared astronomy satellite (IRAS) mission was designed to observe the entire sky in the infrared and to insure that the resultant survey was reliable and complete down to a specifiable flux level. To create accurate maps of the total sky brightness, observations of diffuse emission also needed to be free of significant background variations due to local effects such as Sun and Earth shine. A mission design plan and a survey strategy plan to achieve the required, homogeneous, multiply-confirmed coverage of the whole sky were evolved subject to the instrumental and observational constraints. The observational constraints that had to be met are enumerated as these are important for understanding the strategy and the reasons that, in practice, the sky coverage was neither completely uniform nor homogeneous. In-flight modifications to improve data acquisition are addressed. A chronology of the IRAS mission is given. R.S.F.

N85-18902*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

IN-FLIGHT TESTS

H. H. Aumann, T. N. Gautier, F. C. Gillett, P. Hacking, G. Neugebauer, F. Olnon, and S. Wheelock *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 23 p refs (For primary document see N85-18898 09-89)

Avail: NTIS HC E14/MF A01 CSCL 03A

During the infrared astronomy satellite (IRAS) mission, a number of in-flight tests were conducted to verify or understand those aspects of the performance of the instrument which could not be estimated with sufficient accuracy before the flight. These tests are described herein. Detector/focal plane performance, spectral passband verification, optical performance, and internal reference source stability are addressed. R.S.F.

N85-18903*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DATA REDUCTION

T. J. Chester, B. T. Soifer, C. A. Beichman, J. Fowler, T. N. Gautier, G. Helou, H. McCallon, M. Rowan-Robinson, T. Conrow, M. Hauser et al *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 72 p refs (For primary document see N85-18898 09-89)

Avail: NTIS HC E14/MF A01 CSCL 03A

The transformation of the raw IRAS data into its final form is discussed. A general overview of the data reduction process is presented. The following processing steps were applied to the data: (1) data reconstruction; (2) pointing reconstruction; and (3) calibrating. B.W.

N85-18904*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

FLUX RECONSTRUCTION AND CALIBRATION

G. Neugebauer, S. Wheelock, F. C. Gillett, H. H. Aumann, T. N. Gautier, F. J. Low, P. Hacking, M. Hauser, S. Harris, and P. E. Clegg *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 31 p refs (For primary document see N85-18898 09-89)

Avail: NTIS HC E14/MF A01 CSCL 03A

Three separate functions must be performed in order to reconstruct the flux of a source from the telescope data stream. The effects of the telescope transfer function must be removed from the data. The results must be transferred to relative photometric units. In the case of IRAS, this amounted to establishing the relationship between source amplitudes observed during the survey scans and outputs of flashes of the internal reference source. The relative photometry must be put on an absolute scale; i.e., the flashes of the internal reference source must be calibrated in an absolute sense. The processing by which the signal received at the ground station was converted to the effective detector current is described as well as the process by which the relative photometry was achieved. B.W.

N85-18905*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ANALYSIS OF PROCESSING **c89**

C. A. Beichman, T. J. Chester, R. Benson, T. Conrow, J. Fowler, T. N. Gautier, F. C. Gillett, G. Helou, J. Houck, and H. McCallon *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 63 p refs (For primary document see N85-18898 09-09)

Avail: NTIS HC E14/MF A01 CSCL 03A

The general characteristics of the catalogs of point and small extended sources and sky brightness images are described. The positional and photometric accuracy of the point sources are discussed. An overview of the results of associating TRAS sources with objects appearing in other catalogs is given. B.W.

N85-18906*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SKY COVERAGE, CONFUSION, COMPLETENESS AND RELIABILITY

M. Rowan-Robinson, P. E. Clegg, C. A. Beichman, T. J. Chester, T. Conrow, H. J. Habing, G. Helou, G. Neugebauer, T. Soifer, and D. Walker *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 12 p refs (For primary document see N85-18898 09-89)

Avail: NTIS HC E14/MF A01 CSCL 03A

Ninety-six percent of the sky was sufficiently covered to appear in the catalog. At Galactic latitudes /b/ > 20 deg and at wavelengths of 12, 25, and 60 micrometers, the catalog is essentially complete for sources brighter than about 1.5 Jy. Fewer than one source in 1,000 having two hours confirmed sightings is a spurious object. Confusion caused by background fluctuations due to the large number of sources below the detection threshold is insignificant in the IRAS point source catalog outside of the galactic plane and other high source density areas. A formalism is given for determining completeness and reliability. A.R.H.

N85-18907*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE LOW-RESOLUTION SPECTRA
E. Raimond, D. A. Beintema, and F. M. Olnon *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 21 p ref (For primary document see N85-18898 09-89)
Avail: NTIS HC E14/MF A01 CSCL 03A

The optics and signal handling electronics of the low resolution spectrometer used for the IRAS survey are described. Visual inspection shows that the spectra fall naturally into a number of classes. A classification code was developed which adequately describes the spectra of more than 95% of the sources in the catalog. The spectral classification scheme is tabulated. Representative low resolution spectra are shown for various spectral classes. A.R.H.

N85-18908*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE FORMATS OF THE IRAS CATALOGS AND ATLASES
C. A. Beichman, T. J. Chester, T. N. Gautier, G. Helou, C. Oken, E. Raimond, B. T. Soifer, and D. Walker *In its* Infrared Astron. Satellite (IRAS) Catalogs and Atlases [1985] 43 p refs (For primary document see N85-18898 09-89)
Avail: NTIS HC E14/MF A01 CSCL 03A

The formats of the point source and small extended source catalogs; the total intensity images; and the low resolution spectra are presented in their printed and machine readable forms. Each entry and each column of the catalogs are described. For the machine readable versions, the logical type of each variable and its length in bytes are given. Each tape containing IRAS catalog information has at least one header file containing the date and version number of the data on the tape. A.R.H.

N85-18909*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
X-RAY SPECTRA OF SUPERNOVA REMNANTS Ph.D. - Maryland Univ., 1984
Andrew E. Szymkowiak Feb. 1985 117 p refs
(NASA-TM-86169; M-37; NAS 1.15:86169) Avail: NTIS HC A06/MF A01 CSCL 03A

X-ray spectra were obtained from fields in three supernova remnants with the solid state spectrometer of the HEAO 2 satellite. These spectra, which contain lines from K-shell transitions of several abundant elements with atomic numbers between 10 and 22, were compared with various models, including some of spectra that would be produced by adiabatic phase remnants when the time-dependence of the ionization is considered. Author

N85-18910*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
COMBINED ULTRAVIOLET STUDIES OF ASTRONOMICAL SOURCES Semiannual Progress Report, 1 Aug. 1984 - 31 Jan. 1985
A. K. Dupree, S. L. Baliunas, W. P. Blair, L. W. Hartmann, J. P. Huchra, J. C. Raymond, G. H. Smith, and D. R. Sonderblom Feb. 1985 11 p
(Grant NAG5-87)
(NASA-CR-174361; NAS 1.26:174361; SAPR-9) Avail: NTIS HC A02/MF A01 CSCL 03A

Ultraviolet studies of various astronomical entities are reported. Among the specific phenomena examined were supernova remnants, dwarf novae, red giant stars, stellar winds, binary stars, and galaxies. R.S.F.

N85-18911*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INSTRUMENTAL BACKGROUND IN BALLOON-BORNE GAMMA-RAY SPECTROMETERS AND TECHNIQUES FOR ITS REDUCTION
N. Gehrels Jan. 1985 88 p refs Submitted for publication
(NASA-TM-86162; NAS 1.15:86162) Avail: NTIS HC A05/MF A01 CSCL 03A

Instrumental background in balloon-borne gamma-ray spectrometers is presented. The calculations are based on newly available interaction cross sections and new analytic techniques, and are the most detailed and accurate published to date. Results compare well with measurements made in the 20 keV to 10 MeV energy range by the Goddard Low Energy Gamma-ray Spectrometer (LEGS). The principal components of the continuum background in spectrometers with GE detectors and thick active shields are: (1) elastic neutron scattering of atmospheric neutrons on the Ge nuclei; (2) aperture flux of atmospheric and cosmic gamma rays; (3) beta decays of unstable nuclides produced by nuclear interactions of atmospheric protons and neutrons with Ge nuclei; and (4) shield leakage of atmospheric gamma rays. The improved understanding of these components leads to several recommended techniques for reducing the background. Author

N85-18912*# Louisiana State Univ., Baton Rouge.
ULTRAVIOLET SPECTROSCOPY OF SELECTED ASTRONOMICAL SOURCES Semiannual Status Report, 1 Jul. - 31 Dec. 1984
John S. Drilling 1984 2 p
(Grant NAG5-71)
(NASA-CR-174379; NAS 1.26:174379) Avail: NTIS HC A02/MF A01 CSCL 03A

The birth rates of various kinds of white dwarf progenitors are estimated and the spectra of two very hot O-type white dwarfs are analyzed. The effective temperature of LSE 21 was found to be in excess of 100,000 K. The abundance of iron in the atmospheres of two central stars and numerous very hot O-type subdwarfs was found to be strongly variable. Results obtained by high resolution optical spectroscopy, UBV photometry, and low resolution IUE spectrophotometry for LSS 2018, the central star of the planetary nebulae DS1, are summarized. A planetary nebula surrounding the very hot subdwarf LSS 1362 was discovered. Analysis of results obtained by high resolution optical spectra shows agreement with an effective temperature of 110,000 K derived using low resolution IUE observations. A.R.H.

N85-18913*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
ON THE PROGENITORS OF WHITE DWARFS
J. S. Drilling and D. Schoenberner (Kiel Univ., West Germany) 1985 11 p refs
(Grants NAG5-71; NSF AST-80-18766; NSF INT-82-19240)
(NASA-CR-174378; NAS 1.26:174378) Avail: NTIS HC A02/MF A01 CSCL 03A

Direct observational evidence is presented which indicates that the immediate progenitors of white dwarfs are the central stars of planetary nebulae (approximately 70%), other post-AGB objects (approximately 30%), and post-HB objects not massive enough to climb the AGB (approximately 0.3%). The combined birth rate for these objects is in satisfactory agreement with the death rate of main-sequence stars and the birth rate of white dwarfs. Author

N85-18914# RAND Corp., Santa Monica, Calif.
ASTRONOMY AND SODIUM LIGHTING
W. H. Krase and Katy Wolf Feb. 1984 65 p refs
(Rand/N-2089-RC) Avail: NTIS HC A04/MF A01

The replacement of incandescent and mercury vapor street lights in San Diego with sodium vapor lamps would pose problems for astronomers at Palomar and Mt. Laguna Observatories. The significance of light pollution to astronomers is assessed and

methods of mitigating adverse affects are examined. The costs and efficiency of low- and high-pressure sodium vapor lights are examined. Results show that the most promising method for reducing light pollution impact is to use low pressure sodium vapor lamps. A.R.H.

N85-18915# Royal Observatory, Edinburgh (Scotland).
THE REMOVAL, MECHANICAL HANDLING AND INSTALLATION PROCEDURES FOR DECLINATION TACHOMETER AND ITEK ENCODER
Jay H. Tsutsymi 30 Mar. 1983 7 p
(UKIRT-17; ISSN-0260-9983) Avail: NTIS HC A02/MF A01

The procedures for removing, handling and replacing the declination tachometer and encoder of an IR telescope are detailed. Equipment and manpower requirements are listed and scaffolding, hoist, and safety line preparation is described. Author (ESA)

N85-18916# Royal Observatory, Edinburgh (Scotland).
THE MECHANICAL PROCEDURES FOR THE 8 CHANNEL BOLOMETER
Alf A. Neild 23 May 1984 3 p
(UKIRT-18; ISSN-0260-9983) Avail: NTIS HC A02/MF A01

The disassembly procedure for an IR telescope bolometer is given. Author (ESA)

N85-18917# Royal Observatory, Edinburgh (Scotland).
PROCEDURES FOR THE BONDING OF THE E.M.C. MIRROR ONTO ITS INVAR MIRROR FLANGE
Jay H. Tsutsumi 31 Mar. 1983 8 p
(UKIRT-19; ISSN-0260-9983) Avail: NTIS HC A02/MF A01

Installation of an IR telescope mirror, including alignment procedures, are described. Prebonding preparation and bonding techniques are also outlined. Author (ESA)

N85-18918# Royal Observatory, Edinburgh (Scotland).
IN SITU WASHING PROCEDURES FOR THE UKIRT 3.8 METER PRIMARY MIRROR
Alf A. Neild 30 Sep. 1984 29 p
(UKIRT-20; ISSN-0260-9983) Avail: NTIS HC A03/MF A01

A procedure for washing an IR mirror with mirror and cell in the telescope or with them removed and the telescope resting on the mirror trolley is described. It takes less than one working day. Author (ESA)

N85-18919# Royal Observatory, Edinburgh (Scotland).
THE REMOVAL, MECHANICAL HANDLING AND INSTALLATION PROCEDURES FOR THE RA ITEK ENCODER
Jay H. Tsutsumi 23 Mar. 1984 6 p
(UKIRT-21; ISSN-0260-9983) Avail: NTIS HC A02/MF A01

Procedures for removing and replacing an IR telescope encoder are set out. Hoist and support preparations are described along with encoder assembly and disassembly procedures. Author (ESA)

N85-18920# Royal Observatory, Edinburgh (Scotland).
THE UKIRT CENTRE SECTION STRUCTURAL INVESTIGATION
Keith Raybould 5 Jul. 1984 5 p
(UKIRT-22; ISSN-0260-9983) Avail: NTIS HC A02/MF A01

A finite element analysis was used to determine whether the pointing and tracking performance of the United Kingdom Infrared Telescope could be improved by stiffening the center section. Corner tie strain gage measurements were taken on the center section. Results show that pointing and tracking performance would not be improved by stiffening the telescope center section. Author (ESA)

N85-18921# Royal Observatory, Edinburgh (Scotland).
UKIRT SPECTRO-PHOTOMETRY SYSTEM
J. M. Stewart Jun. 1983 66 p
(UKIRT-23; ISSN-0260-9983) Avail: NTIS HC A04/MF A01

A user manual for the program which controls and acquires data from the United Kingdom Infrared Telescope stellar spectrophotometry system is presented. The photon program can also perform mapping and control various spectrometers. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-18922 Colorado Univ., Boulder.
MOLECULAR HYDROGEN AND THERMAL PHASES IN ASTROPHYSICS Ph.D. Thesis
Stephen Henry Lepp 1984 109 p
Avail: Univ. Microfilms Order No. DA8422623

The importance of hydrogen molecules (H2) in astrophysics and the connection of atomic and molecular physics with radiative, thermal, and dynamical processes in space are examined. Detailed models of the thermal structure and spectral emission of interstellar gas are constructed for a variety of astrophysical environments; X-ray sources in molecular clouds; quasars; and the early universe. Dissert. Abstr.

N85-18923 Texas Univ., Austin.
STUDY OF THE PULSATIONS OF THE ZZ CETI STARS Ph.D. Thesis
Kepler De Souza OliveiraFilho 1984 185 p
Avail: Univ. Microfilms Order No. DA8421775

The ZZ Ceti stars, variable single DA white dwarfs, are all multiperiodic. Since their periods of variation, lying between 109 s and 1186 s, are 1 to 2 orders of magnitude longer than those expected for radial pulsations in white dwarfs, their variations are believed to be due to g- or r-mode nonradial pulsations. The complex light curves of G 117-B15A, G 226-29, and GD385 were deciphered. The rate of change of period with time for the dominant pulsation of G117-B15A, obtaining $1P< or=1.45 \times 10$ to the -14th power/ss at the 68% confidence level, which makes G117-B15A the most stable optical clock known was measured. The wings of its H gamma line e were also measured. The period structure of G117-B15A is such that there is a split pulsation excited with a mean frequency at exactly 3/4 the frequency of the dominant pulsation. This frequency ratio is easily obtained if the pulsations are r-modes, but presents some interpretation difficulty if the pulsations are g-modes. The effect of r- and g-mode pulsations into the light and line profiles of a star undergoing these nonradial pulsations was calculated. Theoretical calculations were applied to the ZZ Ceti star G117-B15A. It is concluded that the observed variations of G117-B15A are not due to r-mode pulsations, but are consistent with g-mode pulsations. Dissert. Abstr.

N85-18924 Texas Univ., Austin.
THE DETERMINATION OF THE POST-NEWTONIAN PARAMETERS IN GRAVITATIONAL THEORY USING LASER RANGING TO THE LAGEOS SATELLITE Ph.D. Thesis
Mark Alexander Vincent 1984 226 p
Avail: Univ. Microfilms Order No. DA8421812

The use of laser ranging to the near-Earth satellite, LAGEOS, to determine two of the post-Newtonian parameters (beta and gamma) of gravitational theory is investigated. In addition to the normal N-body point mass equations of motion, the equations which describe the effect of a finite-size, rotating Earth on the satellite motion are derived. The method of incorporating relativity into the orbit determination problem is described. The results obtained when either beta or gamma is fixed at unity (the value in General Relativity) and the other parameter estimated are: beta = 1.0009 + or - 0.0005 (0.0107) and gamma = 1.0000 + or - 0.0018 (0.0579). In each case, the first uncertainty is the formal standard deviation, while the parenthesized value is the standard deviation resulting from a consider analysis of the systematic errors in the measurement and force models. Both estimates are within two standard deviations of their values in General Relativity. Dissert. Abstr.

N85-18925 Texas Univ., Austin.
THE RESTRICTED PROBLEM OF 2 + N BODIES Ph.D. Thesis
Arthur Lester Whipple 1984 117 p
Avail: Univ. Microfilms Order No. DA8421817

A generalization of the classical restricted problem of three bodies is studied in which the motion of n minor bodies is governed by the gravitational field of two massive primaries and the gravitational interaction of the minor bodies. An integral of the system is derived and it is shown that the classical energy integral of the general problem of bodies and the Jacobian integral of the restricted problem of three bodies are both limiting cases of this new integral. For the case of two minor bodies, fourteen equilibrium solutions of the system are shown to exist. Linear stability analysis reveals that all of the equilibrium solutions are unstable with the exception of four solutions; two in the vicinity of each of the triangular Lagrangian points. These four solutions are found to be linearly stable provided the mass parameter of the primaries is less than a critical value which depends also on the masses of the minor bodies. The effect of a large external mass on the stable equilibrium solutions is examined. The results are applied to the study of the motion and stability of natural and artificial satellites near the triangular Lagrangian points of the Earth-Moon and Sun-Jupiter systems. Dissert. Abstr.

N85-18926 Texas Univ., Austin.
THE STRUCTURE AND DYNAMICS OF RINGED GALAXIES Ph.D. Thesis
Ronald James Buta 1984 1022 p
Avail: Univ. Microfilms Order No. DA8421673

In many spiral and SO galaxies, single or multiple ring structures are visible in the disk. These inner rings(r), outer rings (R), and nuclear rings (nr) are investigated by means of morphology, photometry, and spectroscopy in order to provide basic data on a long neglected phenomenon. The metric properties of each ring are investigated and found to correlate with the structure of the parent galaxy. A survey is made of the less homogeneous non-barred (SA) ringed systems, and the causes of the inhomogeneity are isolated. It is shown that rings can be identified in multiple-ring SA systems which are exactly analogous to those in barred spirals. Most of the observations favor the resonance hypothesis for the origin of these rings in normal galaxies. This hypothesis interprets the rings as concentrations of stars and gas which have developed secularly near the well-known dynamical Lindbald resonances expected to occur in systems perturbed by small non-axisymmetric components in the gravitational potential. Dissert. Abstr.

N85-18927 Massachusetts Univ., Amherst.
TRANSPORT PROPERTIES OF THE OUTER CRUST OF MAGNETIC NEUTRON STARS Ph.D. Thesis
Gregory James Hartke 1984 185 p
Avail: Univ. Microfilms Order No. DA8424857

The intense magnetic field in the outer crust of neutron stars leads to anisotropic transport of charge and thermal energy near the surface. Simple models of thermal transport in an anisotropic medium are considered. Two models for the surface temperature field are presented. The X-ray emission from two radio pulsars is interpreted as examples of this magnetic field effect. Thermal and electrical conductivities of the dense matter in the outer crusts of magnetic neutron stars are important in understanding the evolution and structure of these bodies. The longitudinal transport coefficients are calculated using the correct atomic description of the outer crust of the star, in which the electrons are confined in cylindrical sheaths of Landau orbitals surrounding each chain of nuclei oriented along the magnetic field. It is found that the thermal conductivity is greatly reduced in the outer crust relative to zero field calculations and displays a complex dependence on both density and temperature. Dissert. Abstr.

N85-18928 Wyoming Univ., Laramie.
A COMPARATIVE STUDY OF DUST AND YOUNG STARS IN THREE SMALL GALAXIES Ph.D. Thesis
Jill Suzanne Price 1984 168 p
Avail: Univ. Microfilms Order No. DA8425936

A comparative study is presented of dust and young stars in the central regions of the three small galaxies NGC 205, NGC 185, and NGC 3077 in the U, B, V, and K filters, and at six additional optical wavelengths. All three program galaxies have been successfully modelled with the empirical models of Oemler (1976); NGC 205 and NGC 3077 were also modelled with unsharp mask models. Subtracting model galaxies from the data enabled us to isolate clusters of young stars and dust clouds in the central regions of each galaxy. A comparison of the colors of the young clusters in NGC 3077 and those in NGC 205 reveals that the colors of the clusters in these two small galaxies are different. In NGC 185, diffuse emission after subtracting an Oemler model was discovered. NGC 205 also showed this remnant emission, with very similar colors to those of the remnant in NGC 185, but NGC 3077 did not. The colors of this diffuse remnant emission in NGC 205 and NGC 185 is interpreted as being due to previous episodes of star formation in the two dwarf ellipticals. Dissert. Abstr.

N85-18929# Florida Univ., Gainesville. Dept. of Physics.
SUPERSYMMETRIC INFLATIONARY COSMOLOGY
P. Ramond 1984 17 p refs Presented at 8th Johns Hopkins Conf. on Particle Phys., Baltimore, 29 Jun. 1984
(Contract DE-AS05-81ER-40008)
(DE85-001332; DOE/ER-40008/62) Avail: NTIS HC A02/MF A01

The general requirement imposed on cosmology by particle physics are reviewed. In particular, a model which includes inflation, supersymmetry and grand unification is discussed. This model can be used to put an upper bound on the proton life-time. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N85-18930 State Univ. of New York, Stony Brook.
NEAR INFRARED MODELING OF THE EQUATORIAL REGIONS OF JUPITER AND SATURN Ph.D. Thesis
Barbara Elizabeth Carlson 1984 154 p
Avail: Univ. Microfilms Order No. DA8422575

The near infrared spectral albedos of Clark and McCord (1979) are used to investigate the equatorial structure and composition of the atmospheres of Jupiter and Saturn. This is done by comparing the planetary observations to the results of multiple scattering calculations. The inhomogeneous atmospheres are modeled by dividing the atmospheres into a number of homogeneous layers. The delta Eddington approximation is used to model the radiative transfer through the atmospheres. Scattering parameters are generated using the optical properties of NH3 ice and the stratospheric aerosol as input for a Mie code. Gaseous absorption is modeled with a Goody Random Band formulation of the gas transmissivity. The vertical structures determined are compared with a number of standard model atmospheres. The vertical structures are then used to explain the continuum slope differences and the center to limb variation in the spectra of Jupiter and Saturn along with the limb brightening observed for the deep methane bands on Saturn. Dissert. Abstr.

N85-18931 Massachusetts Univ., Amherst.
A MODEL FOR THE CLIMATIC BEHAVIOR OF WATER ON MARS Ph.D. Thesis
Stephen Mark Clifford 1984 302 p
Avail: Univ. Microfilms Order No. DA8424858

Present climatic conditions on Mars preclude the existence of ground ice in equilibrium with the atmosphere within the latitude band of + or - 40 deg. Yet, various lines of morphologic evidence

suggest that substantial quantities of H2O have survived in the equatorial regolith for billions of years. The stability of equatorial ground ice was examined on the basis of current understanding of the physical properties of the Martian regolith. The results of this analysis suggest that any ground ice, emplaced earlier than 3.5 billion years ago, may have long since been lost by sublimation to the atmosphere. In light of these results, alternative explanations for the long-term survival of equatorial ground ice are considered. Chief among these is the possibility of replenishment from subsurface sources of H2O. Such replenishment may occur in response to the Martian geothermal gradient, whereby H2O is driven from the warmer depths to the colder near-surface regolith. Dissert. Abstr.

N85-18932*# Washington Univ., Seattle.
ANALYSIS OF THE VIKING LANDER 1 SURFACE WIND VECTOR FOR SOLS 45 TO 375 Final Technical Report
C. B. Leovy 1984 13 p ref
(Grant NAGw-228)
(NASA-CR-174349; NAS 1.26:174349) Avail: NTIS HC A02/MF A01 CSCL 03B

The Viking Lander 1 wind sensor data during the period between sols 45 and 375 were corrected. During this period, the heating element of the quadrant sensor which provided the primary signal used for determining wind direction had failed, but both hot film wind sensors were functioning normally. The wind speed and direction corrections are explained. B.G.

N85-18933*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
EXTENDED ATMOSPHERES OF OUTER PLANET SATELLITES AND COMETS Interim Report, 1 Nov. 1984 - 31 Jan. 1985
William H. Smyth and Michael R. Combi Mar. 1985 10 p refs
(Contract NASw-3966)
(NASA-CR-174398; NAS 1.26:174398) Avail: NTIS HC A02/MF A01 CSCL 03B

The lifetimes of hydrogen atoms in the environment of Saturn's magnetosphere can be expected to be quite long (approx. 10 to the 8th power s). Preliminary testing of a model of the Titan hydrogen torus for these long-lived orbits was begun. A draft of the paper describing the analysis of Pioneer Venus observations of Comet P/Encke was completed. Plans to analyze Comet P/Halley data, as well as the development of models for cometary carbon and oxygen are also discussed. Author

N85-18889*# Geological Survey, Washington, D.C.
ASTEROIDS, COMETS AND PLANET FORMATION
Michael H. Carr *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 5-12 (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

N85-18890*# Arizona Univ., Tucson.
MERCURY
Robert G. Strom *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 13-56 Original contains color illustrations (For primary document see N85-18888 09-88)
(Grant NsG-7146)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

N85-18891*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VENUS
R. Stephen Saunders and Michael H. Carr (Geological Survey, Washington, D.C.) *In its* The Geol. of the Terrest. Planets Jun. 1984 p 57-78 Original contains color illustrations (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

N85-18893*# Geological Survey, Washington, D.C.
MOON
Don E. Wilhelms *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 107-206 Original contains color illustrations (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

N85-18894*# Geological Survey, Washington, D.C.
MARS
Michael H. Carr *In* JPL The Geol. of the Terrest. Planets Jun. 1984 p 207-264 (For primary document see N85-18888 09-88)
Avail: NTIS MF A01; SOD HC $16.00 as SN-033-000-00900-3 CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-18934 Arizona Univ., Tucson.
NONLOCAL AND NONLINEAR EFFECTS ON SOLAR OSCILLATIONS Ph.D. Thesis
Jerry David Logan 1984 456 p
Avail: Univ. Microfilms Order No. DA8424907

The response of the solar atmosphere to mechanical and thermal driving due to global solar oscillations was investigated. It was discovered that the coupling of thermal and mechanical modes was very important in reconciling theoretical predictions of the expected change in the solar limb due to solar oscillations and experimental observations of the variability in the solar limb darkening function undertaken at SCLERA (Santa Catalina Laboratory for Experimental Relativity). The coupling between the thermal and mechanical modes occur mainly due to the nonlocal nature of the radiation field. Previous theoretical calculations that used approximations for the radiative transfer that ignored the nonlocal nature of the radiation field predicted expected temperature perturbations (compared to the fluid displacement) that were much too small to be observed. Much larger ratios were found when the radiative transfer was treated properly. A particular solar oscillation can be influenced by the presence of a large number of other modes, if these modes can change the average properties of the medium. Dissert. Abstr.

N85-18935# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
DATA ANALYSIS OF ELECTRON MEASUREMENTS OF THE PLASMA EXPERIMENT ABOARD THE HELIOS PROBES
Werner G. Pilipp, Hans Miggenrieder (Bayerische Staatsministerium fuer Landesentwicklung und Umweltfragen), Karl-Heinz Muehlhaeuser, Helmut Rosenbauer (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and Rainer Schuwen (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) Nov. 1984 48 p refs
(MPE-185; ISSN-0340-8922) Avail: NTIS HC A03/MF A01

Methods to derive distribution functions for solar wind electrons from the measurements of the plasma experiment aboard the HELIOS probes are outlined. Electrons are measured in the energy range from 0.5 to 1660 eV with one-dimensional angular resolution along the ecliptic plane. From these measurements electron distribution functions with high time resolution (18 sec) but poor angular resolution in velocity space (45 deg) and electron distribution functions with high angular resolution (> 5 to 10 deg) but poor time resolution (several minutes to few hours) are derived. Author (ESA)

N85-18936# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 476, APRIL 1984. PART 1: (PROMPT REPORTS). DATA FOR MARCH 1984, FEBRUARY 1984 AND LATE DATA
Apr. 1984 124 p refs
(PB84-215060; SGD-476-Pt-1; NOAA-84062901-Pt-1; LC-79-640375) Avail: NTIS HC A06/MF A01 CSCL 03B

Contents: Data for March 1984--International Ursigram and World Days Service (IUWDS) alert periods (advance and world-

wide); Solar activity indices, Solar flares, Solar radio emission, Inferred interplanetary magnetic field polarity, Mean solar magnetic field, Boulder geomagnetic substorm log); Data for February 1984--(Solar active regions, Sudden Ionospheric disturbances, Solar radio spectral observations, Cosmic ray measurements by neutron monitor, Geomagnetic indices, Radio propagation indices); Late data--(Geomagnetic indices, Cosmic ray indices). GRA

N85-18937# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 476, APRIL 1984. PART 2: (COMPREHENSIVE REPORTS). DATA FOR OCTOBER 1983, JUNE 1981 AND MISCELLANEA
Apr. 1984 124 p refs
(PB84-215078; SGD-476-Pt-2; NOAA-84062902-Pt-2; LC-79-640375) Avail: NTIS HC A06/MF A01 CSCL 03B

Contents: Data for October 1983--(Solar radio bursts at fixed frequencies, Mass ejections from the Sun); Data for June 1981--Solar flares June 1981; Miscellaneous data--(Active regions Meudon 29 July - 21 September 1983, Synoptic solar maps 29 July 21 September 1983, Interplanetary solar particles and plasma IMP 8 data for 1982, Solar proton events 1976-1984, 1982 solar flares = or > 1B and with plage variations). GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-18938 Texas Univ., Austin.
THE VERTICAL STRUCTURE AND STABILITY OF ALPHA MODEL ACCRETION DISKS Ph.D. Thesis
John Kendall Cannizzo 1984 191 p
Avail: Univ. Microfilms Order No. DA8421675

A parameter study of the vertically explicit structure corresponding to steady state, alpha model, thin disk accretion for accreting objects of 1 solar mass was conducted and particular attention paid to the role of convection in the vertical structure and to the location of critical points which represent the onset of thermal instability. Results show that there are at least two distinct physical effects which can give rise to hysteresis behavior. One effect is predominant for large alpha and the other for small alpha. Optically thin conditions are also examined. Scaling laws are presented for the fundamental properties of the vertically explicit models and these are used to derive time scales for various idealized phenomena. An ordering of three disk time scales is presented. Instability associated with hydrogen recombination, convection, or both is compared, with the instability associated with the onset of convection. To understand the effect the vertical structure disk physics has on the burst cycles, scalings obtained from the steady state parameter study were incorporated into a generalized time dependent nonthermal equilibrium model. A comparison between light curves obtained from this model and observed light curves enables restrictions to be placed on the viscosity parameter, the secondary mass transfer rate, and the treatment of the inner boundary. Dissert. Abstr.

N85-18939 Iowa Univ., Iowa City.
RADIO EMISSION FROM RS CV N BINARY SYSTEMS Ph.D. Thesis
David John Doiron 1984 131 p
Avail: Univ. Microfilms Order No. DA8423552

The RS CVn binary stellar systems UX Ari, HR 1099, AR Lac, HR 5110, II Peg lambda And, and SZ Psc were investigated using very large array observations and very long baseline interferometry. The data obtained are consistent with incoherent gyrosynchrotron emission from mildly relativistic electrons which are optically thick to their own radiation at 1.6 GHz and optically thin at 5 GHz and above. The spectral behavior suggests that the radio emission is due to a power law distribution of electrons. Methods of accelerating electrons to account for the observed gyrosynchrotron emission are considered. Dissert. Abstr.

N85-18940 Iowa Univ., Iowa City.
VLBI OBSERVATIONS OF COMPACT DOUBLE RADIO SOURCES Ph.D. Thesis
Mark Warren Hodges 1984 97 p
Avail: Univ. Microfilms Order No. DA8423567

Very long base interferometry (VLBI) maps for the compact extragalactic radio sources 1518 + 047, CTD 93 and 2050 + 364 were obtained at 5 GHz. Each source consists of two nearly equal components separated by a distance that is large compared with the component's size. These observations, in conjunction with those previously published at 1.6 GHz, allow an accurate decomposition of the spectrum of each source. This decomposition can then be used to determine component flux ratios and magnetic fields. The flux maximum for each component of CTD 93 is found to peak near 1 GHz. For 1518 + 047 and 2050 + 364 the stronger component at 1.6 GHz becomes the weaker one at 65, GHz indicating substantially different turnover frequencies. The magnetic field estimates indicate that the energy density of energetic electrons is much greater than that of the magnetic field. No central components were found at a level of 2% of the peak brightness for 1518 + 047 and 2050 + 364, and 5% for CTD 93, The component separations are identical to those found at earlier epochs, ruling out superluminal motion. Additional VLBI array observations of nine previously unmapped sources were made at 1.66 GHz. Dissert. Abstr.

N85-18941# Ball Bros. Research Corp., Gardena, Calif. Time-Zero Lab.
UCB COSMIC RAY EXPERIMENT Final Report
1984 50 p
Avail: NTIS HC A03/MF A01

The instrument package for measuring the abundance of heavy ions, primary cosmic rays ranging from hydrogen to iron, uses a lithium drifted silicon detector array to measure the ionization of minimizing ions. The direction of travel is defined by a drift chamber array. A simplified block diagram is presented as well as engineering drawings and specifications. A.R.H.

N85-18942*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA-RAY BURSTER RECURRENCE TIMESCALES
Bradley E. Schaefer (Maryland Univ., College Park) and Thomas L. Cline Sep. 1984 19 p refs Submitted for publication
(NASA-TM-86157; NAS 1.15:86157) Avail: NTIS HC A02/MF A01 CSCL 03B

Three optical transients have been found which are associated with gamma-ray bursters (GRBs). The deduced recurrence timescale for these optical transients (tau sub opt) will depend on the minimum brightness for which a flash would be detected. A detailed analysis using all available data of tau sub opt as a function of E(gamma)/E(opt) is given. For flashes similar to those found in the Harvard archives, the best estimate of tau sub opt is 0.74 years, with a 99% confidence interval from 0.23 years to 4.7 years. It is currently unclear whether the optical transients from GRBs also give rise to gamma-ray events. One way to test this association is to measure the recurrence timescale of gamma-ray events tau sub gamma. A total of 210 gamma-ray error boxes were examined and it was found that the number of observed overlaps is not significantly different from the number expected from chance coincidence. This observation can be used to place limits on tau sub gamma for an assumed luminosity function. It was found that tau sub gamma is approx. > 10 yr if bursts are monoenergetic. However, if GRBs have a power law luminosity function with a wide dynamic range, then the limit is tau sub gamma > 0.5 yr. Hence, the gamma-ray data do not require tau sub gamma and tau sub opt to be different. Author

N85-18943# Los Alamos Scientific Lab., N. Mex.
X-RAY EMISSION FROM CENTAURUS A

J. Terrell 1984 4 p refs Presented at the X-Ray and UV Emission from Active Galactic Nuclei Conf., Garching, West Germany, 9 Jul. 1984
(Contract W-7405-eng-36)
(DE85-002030; LA-UR-84-2989; CONF-840796-1) Avail: NTIS HC A02/MF A01

The X-ray strength of Cen A (NGC 5128) was monitored for 10 years by Vela 5B, beginning in 1979. The 1973 to 1975 period of exceptional activity and strength was especially well covered, and was characterized by numerous rapid changes in intensity, in agreement with other data, indicating that the nucleus of Cen A is small but massive. DOE

N85-18944# Florida State Univ., Gainesville. Dept. of Physics.
COSMIC AXIONS
P. Sikivie 1984 15 p refs Presented at the 5th Workshop on Grand Unification, Providence, 12 Apr. 1984
(Contract DE-AS05-81ER-40008)
(DE85-001330; DOE/ER-40008/60; CONF-8404155-4; UFTP-84-5) Avail: NTIS HC A02/MF A01

Axion physics is briefly reviewed, including the constraints on the axion decay constant from laboratory experiments, from stellar evolution and from the cosmological axion energy density. Experiments to detect axions emitted by the Sun or axions floating about in the halo of the Galaxy are discussed. DOE

99 GENERAL

N85-18945*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RESIDENT RESEARCH ASSOCIATESHIPS. POSTDOCTORAL AND SENIOR RESEARCH AWARDS: OPPORTUNITIES FOR RESEARCH AT THE JET PROPULSION LABORATORY Annual Report
1984 61 p Prepared in cooperation with National Academy of Sciences National Research Council, Washington, D.C.
(Contract NAS7-918)
(NASA-CR-174343; NAS 1.26:174343) Avail: NTIS HC A04/MF A01 CSCL 05I

Opportunities for research as part of NASA-sponsored programs at the JPL cover: Earth and space sciences; systems; telecommunications science and engineering; control and energy conversion; applied mechanics; information systems; and observational systems. General information on applying for an award for tenure as a guest investigator, conditions, of the award, and details of the application procedure are provided. A.R.H.

N85-18946# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 38, NUMBER 12 Monthly Publication
L. E. Shaffer Dec. 1984 54 p
(AD-A148713; ESN-38-12) Avail: NTIS HC A04/MF A01 CSCL 05/2

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European science and technology and to the institutions and people responsible for these efforts. ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research and Standardization Group. Qualified US scientists travelling in Europe may also be invited to author an ESN article. (Author). GRA

N85-18947# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
[ACTIVITIES REPORT IN AEROSPACE IN WEST GERMANY] Annual Report, 1983 [JAHRESBERICHT 1983]
Helena Thimme, ed. Sep. 1984 132 p In GERMAN Original contains illustrations
(ISSN-0070-3966) Avail: NTIS HC A07/MF A01

Air traffic control, aircraft design, turbofans and turbines, nonnuclear energy, satellite communications and monitoring, Earth observation (from space), and space systems are discussed. The organization of the agency is also described as well as its relationships with the government, business, and science communities. Author (ESA)

N85-18948# Deutsche Lufthansa Aktiengesellschaft, Cologne (West Germany).
DIGEST OF THE DEUTSCHE LUFTHANSA REPORT, 1983 Annual Report, 1983
1983 18 p
(ISSN-0415-603X) Avail: NTIS HC A02/MF A01

The economic states of the Lufthansa airline for the fiscal years 1982 and 1983 is summarized. Company policy is outlined. Author (ESA)

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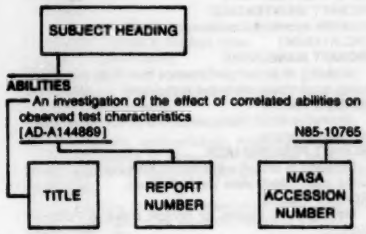
Typical Subject Index Listing



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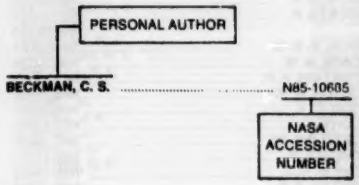

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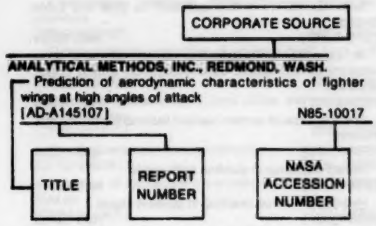

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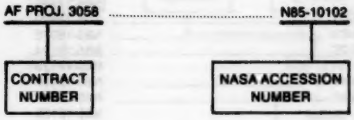

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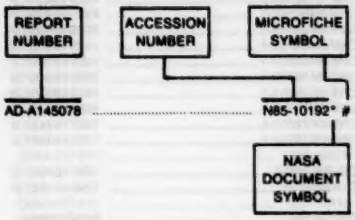

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